THE ROLE OF SOCIAL SUPPORT AND SYNDEMIC FACTORS IN HIV MEDICAL ADHERENCE AMONG AFRICAN-AMERICAN INJECTION DRUG USERS

by

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ABSTRACT

Problem Statement: Substance use, familial conflict, mental illness, and gender disparities may comprise a syndemic exacerbating African-Americans' HIV disparities. Informal caregiving may be protective among persons who inject drugs (PWID). Therefore, the present dissertation assessed the associations between: 1) sex and HIV medical adherence; 2) a latent syndemic and HIV medical adherence; and 3) sex and social support as moderators between the latent syndemic and HIV medical adherence **Methods:** Data were from the BEACON study, of health outcomes among PWID who were persons living with HIV (PLHIV). Participants completed surveys and biomarker assays (*N*=351). **Results:** African-American females were less likely than males to achieve undetectable viral load (UVL; 67.1% vs. 65.9%; non-significant) and optimal acute care utilization (OAU; 53.9% vs. 48.5%; non-significant). Males with moderate physical functioning had 1.3 times the likelihood of UVL, as males with low functioning (Adjusted Incidence Rate Ratio [AIR] = 1.38; 95% Confidence Interval [95% CI] = 1.07, 1.77; *N*=199). In latent class analyses, 9% of participants had high syndemic substance use/mental illness (Class 4); 23% had moderate levels of all factors (Class 3); 25% had high mental illness (Class 2); and 43% had moderate substance use/mental illness (Class 1). In adjusted analyses, individuals whose supporter was their main partner had 35% higher likelihood of UVL, than individuals whose supporter was neither family nor a main supporter (Adjusted Incidence Rate Ratio [AIR] = 1.35; 95% Confidence Interval [95% CI] = 1.05, 1.74). Individuals with frequent health-related support had nearly 30% lower likelihood of OAU, as those with low health-related support (AIR = 0.73; 95% CI = 0.55, 0.97). Finally, individuals with informal main supporters, and higher physical functioning, had lower likelihood of OAU. **Conclusions:** Results suggest that female

PWID PLHIV have high levels of substance use, mental illness, and familial conflict and lower HIV medical adherence compared to males. Furthermore, social support was not clearly associated with increased viral suppression, particularly among females. Healthcare professionals should tailor interventions around constellations of risk factors and gender differences, to improve this population's health outcomes. Additionally, dyadic-level interventions could improve the effects of social support on health outcomes.

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I have often told people that a major goal in life of mine was to complete my schooling before the age of thirty. Indeed, school has been a major part of my life from an early age. From the age of ten years old, I knew that I was going to pursue a doctoral degree. While I still don't know why I chose age thirty by which to accomplish this goal, it is with joy and pride that I can say that I accomplished this feat. And, I am forever grateful to my family, for the early educational training and enthusiasm they gave me, as I certainly did not instill this in myself!

I was also lucky, in that my grandmother was both a formal and informal teacher of mine, as she taught at the Catholic preschool that I attended from the ages of three to five. Additionally, I will never forget Ms. Chin, Ms. Janice, and Father Seamus (rest in peace). Each of you encouraged me and supported me during those early years, and I will always be grateful. Indeed, Christ-the-King Catholic Preschool taught me bible verses, manners, and life skills that I still use to this day. And while I can't say I reflect on my family's time living in Odessa, Florida with much fondness, I will forever be grateful to Mrs. Susan Horowitz, one of the most brilliant, enthusiastic, and caring teachers I have ever had.

For the most part, my formative school years were typical. I dabbled in guitar and theater, and discovered an aptitude for math, thanks to Mrs. Mayra Irizarry, the best algebra and calculus teacher Flanagan High School has ever had. I also had my social outlets as a peer counselor, thanks to the coolest teacher in our school, Mrs. Patty Mucha. I got good grades, had a small group of friends, and dreamed of going to college at the glorious school that I visited with my older sisters Monisha and Tresha. Ahh, the

University of Florida (Go Gators!) It is simply impossible for me to reflect on my recent accomplishments as a researcher, student, and teacher, without acknowledging the impact that school has had on me since the age of nine, when my older sister matriculated there.

Before getting to college, I never would have guessed that so much of my time at UF would be consumed by Gator football and health research. My fondest memories as a college student are with my friends, Imani, Ja'Nelle, and Michelle at Gator games. Two words, ladies: Florida-Georgia game. Ironically, I found that I came to cherish those times with my friends more deeply, the more I became involved with health research that often required me to forgo weekend clubbing and parties. In a manner of speaking, at UF I learned how to work hard and play hard, and love every minute of it. I also nurtured a love of languages, so I credit my good friend and former professor Carolina Gutierrez-Rivas for my fluent Spanish. Te agradezco con todo mi corazón, querida.

All the same, I felt that my time at UF was coming to a close upon graduating with my MPH in 2009. I simply knew I needed a new experience beyond Gainesville. So, while applying to PhD programs and deciding my next move, I was an Adjunct Lecturer in Research Methods for the UF Bachelor's of Health Science Program. It was both one of the most trying and useful times in my life, where I learned first-hand the pitfalls and triumphs of teaching at the university level. Daunting or not, it whet my appetite and I knew that academe was the right path. And while Hopkins wasn't originally on my radar, an informal advisor in my MPH program by the name of Barbara Curbow, a former Hopkins professor, referred me to the Department of Health, Behavior, Society, Dr. Janice Bowie, and the Lighthouse Studies at Peer Point Research Center. Couple that with a prestigious Brown scholarship to come here, and as they say, the rest is history.

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CHAPTER ONE: INTRODUCTION

BACKGROUND

HIV prevalence and disparities in the United States

In 2009, approximately 1.2 million people over the age of thirteen were living with human immunodeficiency virus (HIV) in the United States (CDC, 2010). Current epidemiological estimates suggest that nearly sixty thousand Americans become infected each year with HIV (Dept. of Health and Human Services, 2012). Of those infected with HIV, it is estimated that twenty percent are unaware of their status (CDC, 2010; Prejean et al., 2011). In 2009, African-Americans accounted for nearly fifty percent of new HIV infections, though they represent less than fifteen percent of the U.S. population (CDC, 2010; Prejean et al., 2011). It is also estimated that African-Americans have HIV incidence rates that are seven times higher than that of White Americans (CDC, 2010).

Recent estimates suggest that up to twenty-five percent of transmission occurs via injection drug use (CDC, 2010; Aral, Adimora, & Fenton, 2008). Between 2004 and 2007, fifty-eight percent of persons who inject drugs (PWID) with a new diagnosis of HIV infection were African-Americans, and seventy-five percent lived in urban areas at the time of their HIV diagnosis (CDC, 2010). While African-Americans are at higher risk of HIV infection than other racial and ethnic groups, African-American women bear the majority of the recent HIV/AIDS burden within this community. It is estimated that African-American women are twenty-three times more likely to be infected with HIV than White American women (Kaiser Daily Health Reports, 2006). In many U.S. states, they account for an estimated seventy percent of new HIV cases (Kaiser Daily Health Reports, 2006; CDC, 2010).

Only twenty-eight percent of all persons living with HIV/AIDS (PLHIV) are

aware of their HIV seropositivity, and on medication (CDC, 2010). A large clinical trial of HIV medical adherence found patients receiving inpatient hospital care were seventy to eighty percent adherent (Mannheimer, Friedland, Matts, Child, & Chesney, 2002). Among those with mental illness, and among racial/ethnic minority women, adherence rates are much lower, approximately sixty-five percent while receiving managed hospital care (Wolf et al., 2007; Mannheimer et al., 2002). Adherence rates have been estimated to be fifty to sixty percent among inner-city residents and persons who inject drugs (Wolf et al., 2007). Non-adherence contributes to adverse HIV health outcomes, including more frequent physical sickness and faster progression to AIDS as well as to increased drug resistance (CDC, 2010; Wolf et al., 2007; Mannheimer et al., 2002).

Among all populations impacted by HIV/AIDS in the U.S., African-Americans are least likely to be tested for HIV or have access to antiretroviral therapy (ART; CDC, 2010; Hall et al., 2008; Celentano et al., 2001). Identifying factors that are associated with ART adherence among this population is critical to improving their health outcomes. Additionally, African-American substance users, as compared to those of white race or non-substance users, have low rates of access to ART, as well as the lowest rates of ART adherence (Reynolds et al., 2004; Broadhead et al., 2002; Kalichman & Rompa, 2003; O'Connell et al., 2003; Baker, Kochan, Dixon, Heather, & Wodak, 1994).

African-American substance users are less likely than other racial/ethnic groups to achieve optimal medical adherence. Thus, they are at highest risk for negative health outcomes including higher rates of hospitalization, faster progression of AIDS, and higher mortality rates (Heron, 2010; Barrow, Newman, & Douglas 2008; Shapiro et al., 1999; Reynolds et al., 2004; Buseh & Stevens, 2008). However, while HIV transmission

is usually via unprotected sex or injection drug use, rates of these behaviors do not differ considerably by race, which suggests disparities in outcomes rather than absolute risk (CDC, 2010; Muturi, 2008; Buseh & Stevens, 2008). Nonetheless, African-Americans and PWID are more likely to be PLHIV, have higher rates of HIV transmission, and to have benefited least from the advent of antiretroviral therapy (ART).

Also, while ART has reduced the number of AIDS-related deaths in the U.S. the rates have simultaneously increased among African-American women (CDC, 2010; Holtgrave et al., 2009; Kaiser Daily Health Reports, 2006; DiClemente & Wingood, 1995; Turner, Laine, Cosler, & Hauck, 2003; Wyatt, 2002; CDC, 2010; Prejean et al., 2011). African-American women may have higher risk for HIV infection due to factors such as lack of sexual empowerment, mental illness, and increased stress from gender discrimination, interpersonal conflict and racism (Hall et al., 2008; Knowlton et al., 2011; Muturi, 2008). For these reasons, the present study sought to contribute findings to inform HIV interventions among African-American persons who inject drugs, to improve their health outcomes.

RATIONALE FOR RESEARCH

Social support, gender, and HIV-related syndemic factors

Kalichman, Ramachandran, and Catz (1999), Broadhead et al., (2002), and Parsons, Cruise, Davenport, and Jones, (2006) found that low socioeconomic status, history of mental illness, and strained levels of social support disproportionately impact African-American substance users, and are associated with lower ART adherence. Conversely, it is well-established that social support is predictive of ART adherence (Edwards, 2006; Parsons et al., 2006). Despite this association, most social support

measures do not make distinctions such as absence or presence of social support as it relates to viral suppression and adherence outcomes (Carrieri et al., 2003; Strine et al., 2008). Distinguishing factors such as type, intensity, and varying needs for social support is crucial for understanding the role of social support in PLHIVs' ART adherence, and ultimately, their ability to achieve successful viral suppression (Wagner & Rabkin, 2000; Carrieri et al., 2003). One type of social support, informal care, may be most common among African-American PLHIV, as compared to than other racial/ethnic groups. Informal care refers to unpaid care provided by one's social support network (Pearlin, Semple, & Turner, 1988; Chander, Himelhoch, & Moore, 2006).

Increasing need for informal caregivers in this population may be because HIV/AIDS rates are ever-increasing in African-American communities. Many PLHIV in this group are low-income, and less likely to access routine HIV medical care (Tucker, Burnam, Sherbourne, Kung, &Gifford, 2003; Knowlton et al., 2007). Therefore, they may be more reliant on social support networks, and network members who provide them any amount of informal care. Informal care refers to unpaid emotional or instrumental support, normally given to individuals with serious chronic conditions. Informal caregiving is usually performed by family members, close friends, and significant others, and may include vital assistance such as transportation to and from medical visits, management of ART regimens, and other forms of care coordination (Knowlton & Latkin, 2007; Muturi, 2008; Kalichman et al., 1999; Baker et al., 1994; Edwards, 2006). Thus, social support network members, which may include informal caregivers, may have direct involvement in HIV medical adherence and health outcomes of these individuals. Moreover, informal caregiving may represent a pathway through which ART adherence

and HIV-related outcomes can be improved in African-American and women PLHIV.

Low-income African-American women report lower ART use and HIV medical adherence than higher income groups and other racial/ethnic groups (Mosack, & Petroll, 2009; Knowlton et al.., 2011; Chander, Himelhoch, & Moore, 2006). Thus, ART adherence is crucial to reducing the impact of HIV/AIDS in this community (Edwards, 2006; Knowlton et al., 2011; Carrieri et al., 2003). Understanding more about the roles of social support, particularly informal caregiving provided by family and social network members, is critical in ensuring the likelihood of achieving these outcomes (Edwards, 2006; Chander, Himelhoch, & Moore, 2006). Among African-American women, barriers to HIV medical adherence may include stigma, and/or feeling uncared for by family members (Edwards, 2006; Knowlton et al 2011).

In the U.S., women as compared to men living with HIV tend to begin ART at a later stage of their HIV illness progression, and are less likely to achieve optimal medication adherence and undetectable viral load (Knowlton et al., 2011; Turner et al., 2003; Parsons et al., 2006). Compared to men, women are also more likely to report elevated depression levels after HIV diagnosis, and poorly health outcomes due to lower perceived social support once diagnosed with HIV (Knowlton et al., 2011; Latkin et al., 2002; Parsons et al., 2006; Eaton et al., 2003; Kalichman & Rompa, 2003). This is in contrast to much of the literature in health research, as women are usually more engaged in their health care, and report more engagement in health-promotion behaviors (Marmot, 2006; Malmusi, Artacoz, Benach, Borrell, 2011; Malmusi, Borrell, Benach, 2010).

As defined by Singer (1996), a syndemic refers to multiple co-morbid conditions,

which are mutually reinforcing, and increase disease burden in a population. Among all PLHIV, HIV diagnoses can incite and reinforce syndemic factors such as substance use, mental illness, and familial conflict (Edwards, 2006; Parsons et al., 2006; Kalichman & Rompa, 2003). Additionally, gender differences in HIV health outcomes among African-Americans suggest that women fare worse in achieving undetectable viral loads and engagement in medical care than men. Therefore, more research is needed to understand the role of syndemic factors in HIV medical adherence among African-American PLHIV who are also PWID and at risk of non-adherence.

Finally, the present dissertation research is in response to several major policy initiatives. For example, in 1984, the federal government created block grant legislation requiring every state to set aside five percent of its block grant allocation to provide new or expanded substance abuse treatment services for women (Tracy & Martin, 2007; Bride, 2001; Breitbart, Chavkin, & Wise, 1994). Since then, research has documented widespread variation in implementation of "women's set-aside", as well as declining priority of this initiative, in lieu of funding cuts for HIV research (Tracy & Martin, 2007).

Recommendations have been made for further research within this population, yet relatively few studies have examined unique barriers to optimal acute care outcomes among African-American HIV-positive persons who inject drugs, particularly those already enrolled in care (Parsons et al., 2006; Broadhead et al., 2002; Wilkinson et al., 2007). Therefore, the purpose of the proposed study was to identify correlates of HIV medical adherence among African-American adult persons who inject drugs in Baltimore, Maryland. Research which identifies correlates of medical adherence and outcomes is an understudied precursor to behavior change research. Current behavior change

interventions are predominantly individual-focused and exclusive of social support structures (Beatty, Wheeler, & Gaiter, 2004; Neumann et al., 2002). Moreover, most of these interventions only consider UVL as ART adherence, and no prior research has shown post-intervention effects on maintenance of viral suppression among persons who inject drugs. Therefore, the current study included analyses that considered informal care and social support networks, and multiple dimensions of adherence.

STUDY AIMS

The purpose of the proposed study was to identify correlates of HIV medical adherence in a sample of African-America persons who inject drugs in Baltimore, Maryland. Also depicted in Figure 2.1, the study's aims were to:

1) examine the association between sex and HIV medical adherence (defined as optimal acute care utilization and ART adherence) among a sample of urban African-American adult persons who inject drugs currently engaged in HIV medical care;

2) determine the relationship between the *'SUMIC'* Syndemic (e.g. ***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict), and HIV medical adherence among a sample of urban African-American adult persons who inject drugs currently engaged in HIV medical care;

3) examine sex and social support as potential moderators in the relationship between the *SUMIC* Syndemic and HIV medical adherence among a sample of urban African-American adult persons who inject drugs engaged in HIV medical care.

Study hypotheses

The proposed study also had three hypotheses:

1) females would report lower rates of HIV medical adherence;

2) individuals with higher *SUMIC* Syndemic burden would report lower HIV medical adherence than individuals with lower syndemic burden;

3) females would report higher rates of the *SUMIC* Syndemic and lower rates of HIV medical adherence as compared to males.

Hypothesis 1 is rationalized by aforementioned findings which suggest that HIV-positive African-American women are at highest risk of HIV medication non-adherence (Knowlton et al., 2011; Latkin et al., 2002; Turner et al., 2003). Research has also shown that African-Americans and persons who inject drugs (PWID) are at risk of suboptimal acute care utilization and ART adherence, thereby justifying Hypothesis 2 (Knowlton et al., 2011; Connell, 1987; Wingood & DiClemente, 2000).

Finally, African-American women are at risk of substance use due to mental illness and/or HIV status, and therefore to higher risk of the *SUMIC* Syndemic, thus justifying Hypothesis 3 (Turner et al., 2003; Muturi, 2008; Connell, 1987; Wingood & DiClemente, 2000; Kelly & Kalichman, 2002).

DISSERTATION ORGANIZATION

The organization of this dissertation consists of seven major sections, or chapters. The present chapter, Chapter One contains a brief summary of the issues of interest, along with research literature substantiating the proposed research aims, the specific

research aims, and their accompanying hypotheses. The second chapter, Chapter Two, is a review of the research literature detailing disparities in HIV–related outcomes, and theoretical considerations of these issues. Chapter Three contains detailed description of the research methodology, including the parent study, study population, and detailed operationalization of study variables utilized in quantitative analyses.

Chapters Four, Five, and Six are all manuscripts. Chapter Four assesses sex differences in viral suppression among African-American PWID. Chapter Five present latent class analyses of the *SUMIC* Syndemic, and also assess HIV medical adherence within syndemic classes. Chapter Six assesses correlates of medical adherence among African–American PWID PLHIV, defined as viral suppression and optimal acute care utilization. Each manuscript chapter presents individual studies based on the study's research aims, all analyses conducted to address these aims, results, and discussion and implications of all findings.

All three chapters detail separate sets of analyses in the proposed research. Chapter Seven concludes the dissertation with consideration of the overall contribution of the research, including its strengths, limitations, and implications for researchers and practitioners. For the purposes of this study and all analyses, "sex" and "gender" are used interchangeably, the implications of which are also discussed in Chapter Seven. Finally, an ancillary appendix provides a brief summary and tables of additional analyses conducted with the dissertation dataset.

REFERENCES

Aral, S.O., Adimora, A.A., Fenton, K.A. (2008). Understanding and responding to disparities in HIV and other sexually transmitted infections in African-Americans. *Lancet*, 372, 337-40.

Baker, A., Kochan, J., Dixon, J., Heather, N., Wodak, A. (1994). Controlled evaluation of a brief intervention for HIV prevention among injection drug users not in treatment. *AIDS Care, 6*(5), 559-70.

Barrow, R.Y., Newman, L.M., Douglas, J.M. (2008) Taking Positive Steps to Address STD Disparities for African-American Communities. *Sexually Transmitted Diseases, 35*(12), S1-3.

Beatty, L.A., Wheeler, D., Gaiter, J. (2004). HIV prevention research for African-Americans: Current and future directions. *Journal of Black Psychology, 30*(1), 40-58.

Breitbart, V., Chavkin, W., Wise, P.H. (1994). The accessibility of drug treatment for pregnant women: A survey of programs in five cities. *American Journal of Public Health, 84*(10), 1658-61.

Bride, B.E. (2001). Single-gender treatment of substance abuse: Effect on treatment retention and completion. *Social Work Research, 25*(4), 223-32.

Broadhead, R.S., Heckathorn, D.D., Altice, F.L., van Hulst, Y., Carbone, M., Friedland, G.H., O'Connor, P.G., Selwyn, P.A. (2002). Increasing drug users' adherence to HIV treatment: results of a peer-driven intervention feasibility study. *Social Science & Medicine, 55*(2), 235-46.

Buseh, A.G, Stevens, P.E. (2008). Constrained But Not Determined by Stigma: Resistance by African-American Women Living with HIV. *Women & Health, 44*(3), 1-18.

Carrieri, F.R., Lewden, C., Sobel, A., Michelet, C., Cailleton, V., Chêne, G., Leport, C., Moatti, J.P., Spire, B., APROCO study group. (2003). Impact of early versus late adherence to highly active antiretroviral therapy on immuno-virological response: a 3-year follow-up study. *Antiviral Therapy*, 8, 585-94.

Celentano, D.D., Galai, N., Sethi, A.K., Shah, N.G., Strathdee, S.A., Vlahov, D., Gallant, J.E. (2001). Time to initiating highly active antiretroviral therapy among HIV-infected injection drug users. *AIDS, 15*(13), 1707-15.

Centers for Disease Control and Prevention [CDC]. (2010). HIV/AIDS Surveillance Report, 2008. *Retrieved August 1, 2014 from* http://www.cdc.gov/hiv/surveillance/ resources/reports/2008report/

CDC. (2010). HIV/AIDS and women: For the public. *Retrieved August 1, 2014 from* http://www.cdc.gov/hiv/topics/women/index.htm.

Chander, G., Himelhoch, S. Moore, R.D. (2006). Substance Abuse and Psychiatric Disorders in HIV-Positive Patients: Epidemiology and Impact on Antiretroviral Therapy. *Drugs, 66*(6), 769-89.

Connell, R.W. (1987). *Gender and Power.* Stanford, CA: Stanford University Press.

Department of Health and Human Services [HHS]. (2012). HIV/AIDS 101: Prevention. *Retrieved August 1, 2014 from* http://aids.gov/hiv-aids-basics/hiv-aids101/overview/prevention/.

DiClemente, R.J., Wingood, G.M. (1995). A randomized controlled trial of an HIV sexual risk-reduction intervention for young African-American women. *JAMA, 274*(16), 1271-6.

Eaton, L., Flisher, A.J., Aarø, L.E. (2003). Unsafe sexual behavior in South African youth. *Social Science & Medicine*, 56, 149-65.

Edwards, L.V. (2006). Perceived Social Support and HIV/AIDS Medication Adherence Among African-American Women. *Qualitative Health Research*, 16, 679-91.

Hall, I., An, Q., Hutchinson, A., Sansom, S. (2008). Estimating the Lifetime Risk of a Diagnosis of the HIV Infection in 33 States, 2004–2005. *JAIDS, 49*(3), 294-7.

Heron, M. (2010) Deaths: Leading causes for 2006. *National Vital Statistics Reports, 58*(14), S1-30.

Holtgrave, D.R., Hall, H.I., Rhodes, P.H., Wolitski, R. (2009). Updated annual HIV transmission rates in the United States, 1977-2006. *Journal of Acquired Immune Deficiency Syndrome, 50*(2), 236-38.

Jones, C.P. (2000). Levels of Racism: A Theoretic Framework and a Gardener's Tale. *American Journal of Public Health*, 90, 1212-16.

Kaiser Daily Health Reports. (2006). President Bush's FY 2007 budget proposal would reduce funding for CDC programs. *Retrieved August 1, 2014*, *from* http://www.kaisernetwork.org/daily_reports/print_report.cfm?DR_ID=36165&dr_cat=3.

Kalichman, S.C., Ramachandran, B., Catz S. (1999). Adherence to combination antiretroviral therapies in HIV patients of low health literacy. *Journal of General Internal Medicine, 14*(5), 267-73.

Kalichman, S.C., Rompa, D. (2003). HIV treatment adherence and unprotected sex practices in people receiving antiretroviral therapy. *Sexually Transmitted*

Infections, 79, 59-61.

Kelly, J.A., Kalichman, S.C. (2002). Behavioral research in HIV/AIDS primary and Secondary prevention: recent advances and future directions. *Journal of Consulting & Clinical Psychology, 70*(3), 626-39.

Knowlton, A.R., Latkin, C.A. (2007). Network financial support and conflict as predictors of depressive symptoms among a highly disadvantaged population. *Journal of Community Psychology, 35*(1), 13-28.

Knowlton, A.R., Arnsten, J.H., Gourevitch, M.N., Eldred, L., Wilkinson, J.D., Rose, C.D., Buchanan, A., Purcell, D.W., INSPIRE Study Team. (2007). Microsocial environmental influences on highly active antiretroviral therapy outcomes among active injection drug users: the role of informal caregiving and household factors. *Journal of Acquired Immune Deficiency Syndrome, 46*(2), S110-9.

Knowlton, A.R., Yang, C., Bohnert, A., Wissow, L., Chander, G., Arnsten, J.A., (2011). Main partner factors associated with worse adherence to ART among women in Baltimore, Maryland: a preliminary study. *AIDS Care, 23*(9), 1102-10.

Latkin, C.A., Forman, V., Knowlton, A., Sherman, S. (2002). Norms, social networks, and HIV-related behaviors among urban disadvantaged drug users. *Social Science & Medicine*, 56, 465-76.

Malmusi, D., Artazcoz, L., Benach, J., Borrell, C. (2011). Perception or real illness? How chronic conditions contribute to gender inequalities in self-rated health. *Retrieved August 1, 2014 from* http://www.citeulike.org/user/dmalmusi/author/Malmusi:D.

Malmusi, D., Borrell, C., Benach, J., (2010). Migration-related health inequalities: Showing the complex interactions between gender, social class, and place of origin. *Social Science & Medicine*, *71*(9), 1610-9.

Mannheimer, S., Friedland, G., Matts, J., Child, C., Chesney, M. (2002). The consistency of adherence to antiretroviral therapy predicts biologic outcomes for human immunodeficiency virus-infected persons in clinical trials. *Clinical & Infectious Diseases, 34*(8), 1115-21.

Marmot, M.G. (2006). Status syndrome: a challenge to medicine. *JAMA*, 11, 1304-7.

Mosack, K.E., Petroll, A., (2009). Patients' Perspectives on Informal Caregiver Involvement in HIV Health Care Appointments. *AIDS Patient Care& STDS, 23*(12), 1043-51.

Muturi, K. (2008). Faith-Based Initiatives in Response to HIV/AIDS in Jamaica. *Retrieved August 1, 2014 from* http://ijoc.org/ojs/index.php/ijoc/article/viewFile/167/123.

Neumann, M.S., Johnson, W.D., Semaan, S., Flores, S.A., Peersman, G., Hedges, L.V., Sogolow, E. (2002). Review and meta-analysis of HIV prevention intervention research for heterosexual adult populations in the United States. *Journal of Acquired Immune Deficiency Syndrome*, 30, S106-17.

O'Connell, J.M., Braitstein, P., Hogg, R.S., Yip, B., Craib, K.J., O'Shaughnessy, M.V., Montaner, J.S., Burdge, D.R. (2003). Age, adherence and injection drug use predict virological suppression among men and women enrolled in a population-based antiretroviral drug treatment programme. *Antiviral Therapy*, 8, 569-76.

Parsons, S.K, Cruise, P.L., Davenport, W.M., Jones, V. (2006). Religious Beliefs, Practices and Treatment Adherence Among Individuals with HIV in the Southern United States. *AIDS Patient Care & STDS, 20*(2), 97-111.

Pearlin, L., Semple, S., Turner, H. (1988). Stress of AIDS caregiving: A preliminary overview of the issues. *Death Studies, 12*(6), 501-17.

Prejean, J., Song, R., Hernandez, A., Ziebell, R., Green, T., Walker, F., Lin, L.S., An, Q., Mermin, J., Lansky, A., Hall, H.I., HIV Incidence Surveillance Group. (2011). Estimated HIV Incidence in the United States, 2006-2009. *PLOS ONE 6*(8), e17502.

Reynolds, N.R., Testa, M.A., Marc, L.G., Chesney, M.A., Neidig, J.L., Smith, S.R., Vella, S., Robbins, G.K. (2004). Factors influencing medication adherence beliefs and self-efficacy in persons naive to antiretroviral therapy: a multicenter, cross-sectional study. *AIDS & Behavior, 8*(2), 141-50.

Shapiro, M.F., Morton, S.C., McCaffrey, D.F., Senterfitt, J.W., Fleishman, J.A., Perlman, J.F., Athey, L.A., Keesey, J.W., Goldman, D.P., Berry, S.H., Bozzette, S.A. (1999). Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. *JAMA, 281*(24), 2305-15.

Strine, T.W., Chapman, D.P., Balluz, L., Mokdad, A.H. (2008). Health-related quality of life and health behaviors by social and emotional support. *Social Psychiatry & Psychiatric Epidemiology, 43*(2), 151-9.

Tracy, E.M., Martin, T.C. (2007). Children's roles in the social networks of women in substance abuse treatment. *Journal of Substance Abuse Treatment, 32*(1), 81-8.

Tucker, J.S., Burnam, M.A., Sherbourne, C.D., Kung, F.Y., Gifford, A.L. (2003). Substance use and mental health predictors of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *American Journal of Medicine, 114*(7), 573-80.

Turner, B.J., Laine C., Cosler L., Hauck W.W. (2003). Relationship of gender, depression, and health care delivery with antiretroviral adherence in HIV-infected drug users. *Journal of General Internal Medicine*, 18, 248-57.

Wagner, G., Rabkin, J. (2000). Measuring medication adherence: are missed doses reported more accurately than perfect adherence. *AIDS Care*, 12, 405-8.

Wilkinson, J.D., Zhao, W., Arnsten, J.H., Knowlton, A.R., Mizuno, Y., Shade, S.B., Gourevitch, M.N., Santibanez, S., Metsch, L.R., (2007). Longitudinal Predictors of Health Care-Seeking Behaviors Among HIV-Seropositive Injection Drug Users. *Journal of Acquired Immune Deficiency Syndrome*, 46, S120-6.

Wingood, G.M., DiClemente, R.J. (2000). Application of the theory of gender and power to examine HIV-related exposures, risk factors, and effective interventions for women. *Health Education & Behavior, 27*(5), 539-65.

Wolf, M.S., Davis, T.C., Osborn, C.Y., Skripkauskas, S., Bennett, C.L., Makoul, G. (2007). Literacy, self-efficacy, and HIV medication adherence. *Patient Education & Counseling, 65*(2), 253-60.

Wyatt, G.E. (2002). Does a history of trauma contribute to HIV risk for women of color? Implications for prevention and policy. *American Journal of Public Health, 92*(4), 660-5.

CHAPTER TWO: REVIEW OF THE LITERATURE

INTRODUCTION

Racial and gender disparities in HIV/AIDS

Between 2004 and 2007, fifty-eight percent of persons who inject drugs (PWID) with a new diagnosis of HIV infection were African-Americans, and seventy-five percent lived in urban areas at the time of their HIV diagnosis (CDC, 2010). While the majority of HIV transmission in the U.S. occurs through sexual contact, up to twenty-five percent of transmission occurs via injection drug use (CDC, 2010; Aral, Adimora, & Fenton, 2008). Though they comprise less than fifteen percent of the U.S. population, African-Americans have accounted for half of incident HIV cases since 2009 (CDC, 2010; Prejean et al., 2011). African-Americans have approximately seven times the HIV incidence of White Americans. (Centers for Disease Control and Prevention [CDC], 2010). Therefore, African-Americans and PWID are at greatest risk of negative HIV-related health outcomes and disparities.

While all racial and ethnic groups are affected by HIV/AIDS, African-Americans have the highest HIV incidence, and lowest rates of access to antiretroviral therapy (ART; CDC, 2010; Hall et al., 2008; Celentano et al., 2001). African-American substance users have even lower rates of access to ART, as well as the lowest rates of ART adherence compared to both Whites and/or non-substance users (Reynolds et al., 2004; Broadhead et al., 2002; Kalichman & Rompa, 2003; O'Connell et al., 2003; Baker, Kochan, Dixon, Heather, & Wodak, 1994).

Non-adherence among African-American substance users leads to higher rates of hospitalization, faster progression to AIDS, and higher mortality (Heron, 2010; Barrow, Newman, & Douglas 2008; Shapiro et al., 1999; Reynolds et al., 2004; Buseh & Stevens,

2008). Moreover, while AIDS-related deaths have declined overall since the onset of antiretroviral therapy (ART) in the U.S., the rates have simultaneously increased almost three-fold among African-American women (CDC, 2010; Holtgrave et al., 2009; Kaiser Daily Health Reports, 2006; DiClemente & Wingood, 1995; Turner, Laine, Cosler, & Hauck, 2003; Wyatt, 2002; Prejean et al., 2011).

Additionally, women are a growing number of incident HIV cases (CDC, 2010). They are also predisposed to HIV infection due to their increased likelihood of experiencing intimate partner violence and/or rape, as compared to men (United Nations Population Fund, 2002). Given the exponentially higher rates of HIV within African-American communities and likelihood of having same-race sexual partners, African-American women who are unaware of their partner's HIV status are often unknowingly infected with HIV, may be diagnosed at a more advanced stage of illness, and are therefore less likely to achieve viral suppression and other positive HIV health outcomes (Edwards, 2006; Turner, Laine, Cosler, & Hauck, 2003; Payne, 1997; Fowler & Hill, 2004; Kalichman et al., 1999).

African-American women may have increasing risk of HIV partly due to higher rates of HIV within the African-American community compared to other racial/ethnic groups, which suggests that unique contextual factors exist for this group. One reason for the increasing prevalence of HIV infection among African-American women, rather than men, may be having male partners who have sex with men (Muturi, 2008; Hall et al., 2008; Melkote et al., 2000; Prejean et al., 2011; CDC, 2010). Pervasive stigma of homosexual activity leads many African-American men to maintain heterosexual relationships, yet are unlikely to use condoms with either their male or female sexual

partners (Melkote et al., 2000).

They are also less likely than heterosexual African-American men to regularly get tested for HIV, and therefore unknowingly serve as 'bridge' populations that spread HIV in both African-American men and women (Muturi, 2008, Buseh & Stevens, 2008). African-American women may also be at higher risk of HIV infection due to psychosocial factors such as lack of sexual empowerment, and increased stress sexism and racism, as compared to men and/or other racial groups (Hall et al., 2008; Knowlton et al., 2011).

Medical mistrust among African-Americans – a barrier to HIV-related care

Race and gender disparities place African-American women at risk for increased incidence of HIV infection than their male African-American counterparts, and also other racial/ethnic groups. In addition, medical mistrust is pervasive in the African-American community, which reduces likelihood of seeking medical care (Gaston & Alleyne-Green, 2013). As a result, advancements such as reduction in morbidity due to AIDS-related opportunistic infections (OI) have not been seen among African-Americans (Gaston & Alleyne-Green, 2013).

Between 1991 and 2001, rates of OIs simultaneously reduced among White Americans, and increased among their African-American counterparts (Gaston & Alleyne-Green, 2013; Metha, Moore, & Graham, 1997; Malebranche, 2005; Tobias, Cunningham, Cunningham, & Pounds, 2007). Recent estimates also suggest that compared to White Americans, African-Americans are between 9 and 20 times more likely to die from AIDS-related illnesses (Gaston & Alleyne-Greene, 2013; Office of Minority Health, 2006).

Several researchers posit that medical mistrust in the African-American community remains due to recent humans rights violations such as the Tuskegee Syphilis Study (Gaston & Alleyne-Green, 2013; Boulware, Cooper, Ratner, LaVeist, & Powe, 2003; Washington, 2006). Jones (2000) also cites institutional racism as a formidable barrier to African-Americans engagement in health care, such that even when they access medical services, they are treated differentially and usually with inferior care compared to White Americans. As a result, recent controversy around the Henrietta Lacks legacy, coupled with existing medical mistrust, has engendered deep resentment in the African-American community toward the medical establishment (Gaston & Alleyne-Greene, 2013; Thornburn-Bird & Bogart, 2005; Washington, 2006).

Finally, Ross et al (2006) found that HIV-related conspiracy beliefs about medical care were more deeply held among African-American women than men, and that HIV-related conspiracy beliefs among African-American men were associated with reduced rates of condom use, irrespective of the sexual orientation of these men (Gaston & Alleyne-Greene, 2013; Ross, Essien, & Torres, 2006). In a similar vein, research suggests that when African-Americans are engaged in care, better patient-provider communication was associated with increased HIV medical adherence among PLHIV (Bakken et al., 2000; Knowlton et al., 2010). Therefore, more research is needed to understand the roles of medical mistrust and patient-provider engagement in HIV medical adherence.

SOCIAL SUPPORT

Social support, informal care, and HIV medical adherence

Irrespective of race and gender differences, it is established that social support is

associated with health behaviors, including HIV viral suppression and acute care utilization (Glass, Perrin, Campbell, & Soeken, 2007; Marmot, 2006; Robertson, 2006; Knowlton et al., 2011; Edwards, 2006; Parsons et al., 2006; Strine, Chapman, Balluz, & Mokdad, 2008). In the research literature, social support is usually defined as perceived availability of basic support, whether instrumental, informational, or emotional (Eaton et al., 2003; Carrieri et al., 2003; Burke & Dunbar-Jacob, 1995; Coker et al., 2003). For example, research suggests many PLHIV belong to an organized religion, and use their religion to cope with their illness, which may predict higher HIV medical adherence (Cotton et al., 2006). However, most social support measures do not distinguish absence or presence of social support that is specific to HIV-related care. Additionally, factors such as the reciprocity, or mutual exchange, of support within social networks are under-identified (Carrieri et al., 2003; Strine et al., 2008). It is possible that within in the context of HIV, social support in the form of informal (unpaid) care receipt may impact adherence-related outcomes.

Low income African-American PLHIV are more likely than other racial/ethnic groups to report informal care provision (Pearlin, Semple, & Turner, 1988; Chander, Himelhoch, & Moore, 2006). This may be because HIV/AIDS rates are ever-increasing in African-American communities, and many PLHIV in this group are low-income, and less likely to access routine HIV medical care (Tucker et al., 2003; Knowlton et al., 2007). Informal care refers to unpaid support normally given to individuals with serious chronic conditions, usually performed by family members, close friends, and significant others.

Informal caregivers may provide vital assistance for PLHIV such as transportation to and from medical visits, management of ART regimens, and other forms of care

coordination (Knowlton & Latkin, 2007; Jones, 2000; Muturi, 2008; Kalichman et al., 1999; Baker et al., 1994; Edwards, 2006). Thus, social support network members, which may include informal caregivers, likely have direct involvement in HIV medical adherence and health outcomes of these individuals.

These individuals may be responsible for much of the care of PLHIV, such as accompanying individuals to medical appointments, household chores, and assisting with their medications (Tucker et al., 2003; Knowlton et al., 2007; Knowlton et al., 2011; Edwards, 2006; Tucker et al., 2003; Mosack, & Petroll, 2009). Differentiating type, need for, and amounts of social support and informal care is crucial for understanding subsequent effects on PLHIVs' ART adherence, and ultimately, their ability to achieve successful HIV viral suppression and positive health outcomes (Wagner & Rabkin, 2000; Carrieri et al., 2003). More research is needed, therefore, to understand the pathways through which ART and HIV medical adherence of PLHIV is impacted by family structure, social support, and informal caregiving.

Gender differences in social support and HIV health outcomes

In the U.S., women PLHIV tend to begin ART at a later stage of their HIV illness progression than men, and are less likely to achieve optimal medication adherence and undetectable viral load (Knowlton et al., 2011; Turner et al., 2003; Parsons et al., 2006). Also, compared to men, women are also more likely to report elevated depression levels after being diagnosed with HIV (Knowlton et al., 2011; Latkin et al., 2002; Parsons et al., 2006; Eaton et al., 2003; Kalichman & Rompa, 2003). However, this is contrary to extant health services research literature, given that women are usually more engaged than men in their health care, and report more engagement in health-promotion behaviors (Marmot,

2006; Malmusi, Artacoz, Benach, & Borrell, 2011; Malmusi, Borrell, & Benach, 2010).

While women report higher levels of social support in general, HIV-positive women are at higher risk of treatment interruptions, discontinuation of ART, and faster AIDS progression than men (Kalichman & Rompa, 2003; Vitiello et al., 2003). Therefore, more research is needed to identify the role of social support as a buffer of mental illness and other factors which reduce engagement in care among women. Among low-income African-American women in particular, lower rates of adherence are reported, as compared to higher income groups and/or other racial and ethnic groups (Mosack, & Petroll, 2009; Knowlton et al.., 2011; Chander, Himelhoch, & Moore, 2006). Because HIV/AIDS incidence is increasing more quickly among African-Americans than in any other segment of the U.S. population, ART adherence is crucial to reducing the impact of HIV/AIDS in this community (Edwards, 2006; Knowlton et al., 2011; Carrieri et al., 2003).

HIV CO-MORBIDITIES AND SYNDEMIC FACTORS

Co-occurrence of mental illness, substance use, and violence

Irrespective of HIV status, mental illness is a growing issue among adults in the United States. According to the National Survey on Drug Use and Health, in 2012, an estimated 44 million adults aged eighteen or older in the United States had some form in mental illness in the past year, which is nearly twenty percent of the general population (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013). This rate is increasing, as prevalence of mental illness in the U.S. was eighteen percent in 2008 (SAMHSA, 2013; Aldworth et al., 2009; Novak, Colpe, Barker, & Gfroerer, 2010). Adult women are more likely than men to be diagnosed with serious mental illnesses, which

include major depression, bipolar disorder, post-traumatic stress disorder (PTSD), and schizophrenia (SAMHSA, 2013; Aldworth et al., 2009; Novak, Colpe, Barker, & Gfroerer, 2010). A growing body of literature also suggests that mental illness is both a major risk factor for, and consequence of, HIV infection (Kaaya et al., 2013).

Several studies suggest that depression is a least twice as high among persons living with HIV (PLHIV) as compared to non-infected individuals (Maj, Janssen, Starace, Zaudig, & Satz, 1994; Kaaya et al., 2013; Owe-Larsson, Sall, Salamon, & Allgulander, 2009). Moreover, among PLHIV, mental illnesses are more common than physical co-morbidities such as diabetes or hypertension (Goulet et al., 2007; Kaaya et al., 2013). Similarly, mental illness and substance use often co-occur, in the general populations and also among PLHIV. In 2012, illicit drug use was twice as prevalent among individuals who had some form of mental illness, as compared to those who did not have mental illness (26.7% vs. 13.2%, respectively; SAMHSA, 2013). This trend remained after accounting for type of mental illness, and types of substances (including marijuana, cocaine, hallucinogens, and prescription drugs). A 2014 study suggests that those with severe mental illness were between three to five times more likely to use either licit and/or illicit substances (Hartz et al., 2014).

Substance use and mental illness are factors that increase the health burden of PLHIV. In addition, these factors often create tension and stressors in the PLHIV' social environment, including familial conflict and violence. PLHIV often experience stigma and alienation from their own family members and community, which often creates a hostile environment with less social support available to them (Hossain & Kippax, 2010; Parker & Aggleton, 2003). Therefore, conflict represents a common predictor and

outcome of HIV, similar to both substance use and mental illness.

Mental illness, substance use, and familial conflict – a syndemic among African-American PLHIV

The dearth of theoretically-informed, tertiary HIV prevention programs geared towards African-Americans represents a gap in the literature (Johnson et al., 2008; Gielen, McDonnell, O'Campo, & Burke, 2005; Tobin, Kuramoto, Davey-Rothwell, & Latkin, 2011; McDaid & Hart, 2010). Health behavior theories such as Syndemic Theory help to characterize the experiences of those most vulnerable to HIV/AIDS disparities: African-Americans who may experience multiple (or syndemic) health threats from mental illness, substance use, and familial conflict.

Singer (1996) defines a syndemic as multiple risk factors that synergistically contribute to increased disease burden in a given population. What can be referred to as the *'SUMIC'* Syndemic (e.g. ***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict), places African-American women at high risk of death and/or disability related to HIV/AIDS in the United States. Despite the critical need for research to inform culturally-tailored interventions within this community, African-Americans remain underrepresented in public health research (Muturi, 2008; Johnson et al., 2008; Lichtenberg, Brown, Jackson, & Washington, 2004; Jones, 2000). Research is needed that includes African-Americans, and identifies race as more than a sociodemographic factor to be controlled for. In light of well-established differences in HIV-related outcomes due to race, gender, and culture, more research is needed to identify factors which may reduce these adverse outcomes, such as social support and informal care

receipt (McDaid & Hart, 2010; Kelly & Kalichman, 2002; LaVeist, 2005; Newman, Williams, Massaquoi, Brown, & Logie, 2008; Woodward, Taylor, Bullard, Neighbors, Chatters, & Jackson, 2008).

Among PLHIV experiencing the '*SUMIC'* Syndemic, there is considerable debate regarding whether presence of syndemic factors can be established temporally. First, for persons who inject drugs, risk of HIV infection is much higher than for non-users, because injection drug use is a more efficient route of HIV transmission than unprotected sex (CDC, 2010). Next, mental illnesses frequently co-occur with substance use, both of which are associated with higher rates of ART non-adherence, and vice versa (Kaaya et al., 2013; Senn & Carey, 2008; Wyatt, 2002; Zierler & Krieger, 1997). Mental illness may predispose individuals to substance use, while substance use may affect mental illness symptoms. As a result, a disproportionate number of substance users report having been diagnosed and treated for depression, schizophrenia, manic depressive disorder, and/or other serious mental illness (Senn & Carey, 2008; Latkin et al., 2002; Johnson et al., 2008). From a treatment perspective, however, temporality of substance and mental illness is unnecessary to establish presence of the *SUMIC* Syndemic; instead comprehensive treatment strategies are paramount.

Familial conflict refers to disagreements between family members, between family members who are often same household residents (Dunbar, 1990; Chesney & Folkman, 1994; Feaster et al., 2010). Such conflict may arise from acute events such as moving, divorce, or financial strain (Dunbar, 1990; Chesney & Folkman, 1994; Semple et al., 1997). Chronic familial conflict, however, refers to ongoing clashes between kin which can result in verbal and/or physical abuse (Dunbar, 1990; Chesney & Folkman,

1994). Much of the literature on familial conflict and HIV proposes that an HIV diagnosis represents a chronic stressor in households which may subsequently trigger familial conflict, substance use and/or mental illness (Semple et al., 1997; Chesney & Folkman, 1994; Zea, Reisen, Poppen, Bianchi, & Echeverry, 2005; Li, Ji, Ding, Tian, & Lee, 2012).

Examination of familial conflict as a syndemic factor builds on extant research in intimate partner violence (IPV) and HIV risk, which establishes a relationship between IPV and increased risk of HIV infection (Singer, 1996). Moreover, most of this literature establishes the link between IPV and HIV infection among women, who are most often low-income and racial/ethnic minorities (Feaster et al., 2010). Therefore, gender disparities in HIV include intimate partner violence as a syndemic factor which places African-American women at increased risk for adverse HIV health outcomes (Singer, 1996; Feaster et al., 2010). However, intimate partner violence can be viewed as a subset of a familial conflict, which is a larger construct and less gender-specific (Minze, McDonald, Rosentraub, & Jouriles, 2010).

Few studies examine the larger construct of familial conflict as a non-gender-specific health determinant, to establish new ways to prevent tertiary complications among PLHIV (Sanders-Phillips, 2002; Jones, Beach, Forehand, & Foster, 2003). Therefore, the proposed study was unique in examining the role syndemic factors in tertiary prevention of HIV rather than primary prevention of infection (Sanders-Phillips, 2002). Moreover, this study considers the threat of familial conflict as non-gender specific (Semple et al., 1997; Li et al., 2012). Active substance use, mental illness, and familial conflict may represent formidable barriers to HIV medical adherence, by

complicating HIV medical regimens themselves.

Cognitive impairment may result due to substance use, which can reduce likelihood of HIV medical adherence. Additionally, medications which may be used to treat mental illness and/or substance use may interact with ART adherence regimens (Zea et al., 2005; Li et al., 2012). Among African-Americans experiencing the '*SUMIC*' Syndemic, little research has been conducted to identify protective factors that may predict their ART adherence and outcomes (Kelly & Kalichman, 2002; Robertson, 2006; Knowlton et al., 2011; El-Bassel et al., 2009). Knowlton et al. (2011) and Latkin et al. (2002) have both demonstrated that social networks were highly predictive of HIV adherence related behaviors among African-American PWID PLHIV, and may be protective in achievement of viral suppression and other adherence-related outcomes.

Social support appears to be an important moderator in the relationship between '*SUMIC*' Syndemic status and HIV medical adherence. As mentioned, HIV positive women in the U.S. are more likely to report history of mental illness (Knowlton et al., 2011; Marmot, 2006; Fremont et al., 2007). Among PWID PLHIV African-American women, rates of social support are typically lower than their male counterparts, as is their likelihood of achieving viral suppression (Buseh & Stevens, 2008; CDC, 2010). Their reported rates of mental illness are concurrently higher, suggesting that they are most vulnerable to the '*SUMIC*' Syndemic as well (Fremont et al., 2007). Therefore, the proposed study explored gender differences in HIV medical adherence.

GENDER AND SYNDEMIC FACTORS

Gender, *SUMIC* Syndemic factors, and PLHIV' health – a conceptual framework

Prevention efforts for women living with HIV have been less funded and less successful as compared interventions with other groups (CDC, 2010). Possible reasons for this include a lack of research that is theoretically-informed and inclusive of African-American women who are the new face of HIV (Connell, 1987; Wingood & DiClemente, 2000). Moreover, most prevailing theories of health behavior emphasize cognitive processes and assume such processes occur identically in men and women (Eaton, Flisher, & Aarø, 2003). Findings by King (1999), Chang (2003), and Melkote, Muppidi, and Goswami, (2000) suggest that race, gender roles, and social status impact women differently than men, and these effects are compounded in African-American women.

As mentioned, Syndemic Theory can illuminate theoretical rationale for HIV disparities experienced by African-American PLHIV (Singer, 1996). Additionally, Social Cognitive Theory of Gender Differentiation, and Theory of Gender and Power can offer insight into HIV disparities seen within this group, where African-American fare consistently worse than their male counterparts in ART adherence and other HIV-related health outcomes (Singer, 1996; Glanz, Lewis, & Rimer, 2002). Collectively, these theoretical considerations identify African-American women with highest risk of both *SUMIC* Syndemic factors and HIV medical non-adherence.

Social cognitive theory (SCT) states that the learning process is shaped by a multidimensional relationship between behavior, environmental factors, and personal factors (Bandura, 1998; Bussey & Bandura, 1999). This process can refer to a variety of developmental processes, such as the emergence of personality traits, or the adoption of health promotion behaviors (Bandura, 1998). SCT, when applied to public health, posits there are only certain conditions under which a person will adopt a health preventive

action (Bandura, 1998). First, a person must believe that the benefits of performing the behavior outweigh the costs. Second, a person must be willing to set and achieve goals for themselves, such that their progress has adequate incentive. Lastly, the person must have a sense of personal agency (self-efficacy) with respect to performing the preventive behavior (Bandura, 1998).

Two key constructs of SCT, self-efficacy and observational learning, provide a useful framework within which gender differences in HIV health outcomes can be conceptualized. As mentioned, self-efficacy refers to an individual's personal agency or belief in their ability to produce desired outcomes as a direct result of their actions (Bussey & Bandura, 1999; Bandura, 1998). People will only be pro-active in their health behaviors if they are cognitively aware of their risk, feel capable of making changes, and believe that said changes will be of positive benefit. African-American women consistently report lower levels of perceived self-efficacy with respect to engaging in HIV health related behaviors, such as condom use with their primary sexual partners (Gullette, Wright, Booth, & Stewart, 2010; Edwards, 2006; Buseh & Stevens, 2008; Schröder, Hobfoll, Jackson, & Lavin, 2001). Reynolds et al., (2004) and Schneider, Kaplan, Greenfield, Li, and Wilson (2004) found interventions to increase self-efficacy among African-American females were predictive of increased ART adherence and increased engagement in care with HIV health care providers. However, findings by Knowlton et al (2007) suggest that ART-related self-efficacy was not associated with undetectable viral load. Therefore, more research is needed to assess factors associated with viral suppression among African-American female PLHIV.

Gender serves as a sociodemographic factor which places African-American

women at risk for lower rates of HIV medical adherence and lower rates of optimal acute care utilization. Additionally, observational learning within the context of SCT states that individuals learn much of their health behaviors via direct observation and modeling of others' behaviors (Bussey & Bandura, 1999; Bandura 1998). This concept, therefore, considers gender differentiation, due to societal roles, as a potential modifier of the relationship between HIV risk and health outcomes among African-Americans. Applying this concept to development, much of what African-American females learn about their sexuality and roles is via peers, media, and familial structure (Bussey & Bandura, 1999; Glass et al., 2007; Gullette et al., 2010).

In this light, media and cultural factors are sociocultural determinants of health which influence norms around sex roles. Media portrayals objectify African-American females placing them at risk for reduced sexual health awareness and empowerment, while rap music culture which perpetuates a hyper-sexualized cultural stereotype for African-American females (Prachakul, Grant, & Keltner, 2007; Edwards, 2006; Connell, 1987; Wingood & DiClemente, 2000). Among African-Americans, the common single-parent family household also usually correlates to lower socioeconomic status (Ehrhardt, Yingling, Zawadzki, & Martinez-Ramirez, 1992; Robertson, 2006). These family structure characteristics are explicative of the aforementioned lower social support levels experienced by African-American women PLHIV.

The cultural acceptability of the single-parent household structure represents a family/household level health determinant, as African-American youth are most likely to have little parental supervision and interaction (Herek, Capitanio, & Widaman, 2002; Edwards, 2006; Broadhead et al., 2002). Thus, they are less likely to have parental

guidance regarding sexual health, substance use, all of which may contribute to disproportionate rates of HIV/AIDS within the African-American community. African-American culture defines social norms, collective efficacy and social cohesion around health-related behaviors (Latkin et al., 2002; Parsons et al., 2006; Edwards, 2006; Fowler & Hill, 2004).

Gender differences in HIV-related outcomes – theoretical underpinnings

Theories such as Gender Differentiation of SCT suggest that unique risk factors for HIV risk impact women, particularly in the African-American community (Glass et al., 2007; Coker et al., 2003; Knowlton et al., 2011). Theory of Gender and Power provides a useful theoretical framework for gender differences in HIV outcomes among African-American PWID PLHIV (Connell, 1987; Wingood & DiClemente, 2000). According to the Theory of Gender and Power, the relationship between men and women is gendered, and possesses three social structures (Connell, 1987; Wingood & DiClemente, 2000). The first, sexual division of labor, refers to the gendered tendency of men and women to assume distinct occupations, which typically subordinate women to men. The second social structure identified by the theory is the sexual division of power. This refers to the unequal access to societal goods due to the power differential between the sexes (Connell, 1987; Wingood & DiClemente, 2000).

Finally, the third social structure identified is cathexis, which refers to the social norms and sexual attachments differentially created and reinforced between the sexes. The theory of gender and power can be used to examine well-established gender disparities among African-American females as compared to other groups (Connell,

1987; Wingood & DiClemente, 2000). The sexual division of labor is characterized by societal concepts such as "women's work", the socially accepted view that women are incapable of pursuing certain professions and thereby have limited career advancement potential, thereby referring to the differential created by the sexual division of power (CDC, 2005; Jones, 2000; Dreachslin, Weech-Maldonado, & Dansky, 2004). For African-Americans, disparities exist in educational attainment as compared to other races, where they have the lowest rates of baccalaureate and/or graduate education (U.S. Census Bureau, 2008; LaVeist, 2005; Kalichman & Rompa, 2003; Harrison & Beck, 2005).

Even among college-educated African-Americans, lower salary attainment is demonstrated in every professional field, and these disparities in work status and advancement are consistent in substance abusing populations as well (Jones, 2000; Dunlap, Golub, & Johnson, 2006). African-American women are more likely to have college degrees than African-American men, but are less likely than their white and/or male counterparts to receive promotions or salary increases with equivalent training and experience (Jones, 2000; Nunez-Smith, Curry, Bigby, Berg, Krumholz, & Bradley, 2007). Thus, they are less likely to have medical insurance and regular access to medical care, resulting in disproportionate risk of syndemic outcomes, particularly depression, and lower rates of ART adherence if they are PLHIV (Knowlton et al., 2001; Kelly & Kalichman, 2002; Latkin et al., 2002; LaVeist, 2005; Muturi, 2008).

Given the likelihood of single-parent household familial structure, African-American women are usually under more financial strain than other groups. Often, in single-parent households, female children are given more household responsibility, and are expected to care for younger siblings more than male children (Prachakul, Grant, &

Keltner, 2007; Edwards, 2006). Gender roles in the African-American community prescribe expectations of women to share their limited resources with family members and main partners, more than African-American men (LaVeist, 2005; Dunlap, Golub, & Johnson, 2006; Kelly & Kalichman, 2002). Also, African-American women are more likely to provide informal care, and less likely to receive informal care as compared to other racial/ethnic groups and their African-American male counterparts (Dunlap, Golub, & Johnson, 2006; Feaster et al., 2010; Broadhead et al., 2002). This creates the social norms and reinforcement referred to as cathexis, which perpetuates reduced societal power, access to labor, and social norms resulting in poor health outcomes for African-American PLHIV women (Herek et al., 2002; Edwards, 2006; Broadhead et al., 2002).

HIV MEDICAL ADHERENCE

Operationalization of HIV medical adherence – research considerations

Aforementioned research suggests that African-American race, female sex, active substance use, mental illness, and familial conflict represent factors which may predict negative health outcomes among PLHIV. Social support is a purported protective factor against these negative health consequences, though more research is needed to understand nuances including perceived versus enacted support, types of social support, and support reciprocity between PLHIV and their informal caregivers. A related consideration, however, is the definition of HIV medical adherence itself. In the present study, viral suppression is conceptualized as a proxy for medication adherence. Similarly, optimal acute care is conceptualized as an outcome of therapeutic adherence.

However, the broader adherence literature in HIV builds on extant chronic disease

research of patients with Type 2 diabetes and hypertension, which are often co-morbid with HIV (Crane, Van Rompaey, & Kitahata, 2006). With respect to chronic illnesses including HIV, however, necessary distinctions must be made between two dimensions of adherence – therapeutic adherence and medication adherence. In contrast, therapeutic adherence has been defined as the extent to which a person's behaviors (i.e., taking medication, getting health screenings, eating healthily, and attending clinics for follow-up appointments) coincide with the health behaviors recommended by his/her health care provider (Jin, Sklar, Min Sen Oh, & Li, 2008; Shearer & Evans, 2001).

In contrast, medication adherence, or medication compliance, is defined as an individual's conformity to their healthcare provider's recommendations about day-to-day treatment respect to the timing, dosage, and frequency of prescription medications (Cramer et al., 2008). Therefore, for PLHIV, therapeutic adherence is a global term to define a patient's ability to maintain behaviors including: accessing HIV primary care, engaging in healthy lifestyle choices, and abstaining from substance use (Mannheimer et al., 2002; Chesney, 2006). Medication adherence, however, is a specifically used term to define a patient's compliance to ART (Howard et al., 2002; Chesney, 2006). While therapeutic adherence includes medication adherence, the latter does not include the former. Therefore, while medication adherence refers solely to prescription regimes, HIV therapeutic adherence encompasses a broad array of factors, including these regimens, and early engagement and sustained retention in care (Chesney, 2006; Howard et al., 2002). Both dimensions of adherence are vital to positive health outcomes among PLHIV, and distinguishing correlates of each type of adherence remains a gap in the literature.

Much of the literature in HIV-related adherence literature focuses on medication

adherence, and utilizes viral suppression as primary biomarker data. However, it is an outcome of medication adherence, not a direct measure of medication adherence itself. Findings by DiMatteo, Giordani, Lepper, and Croghan, (2002) and Mannheimer, Friedland, Matts, Child, and Chesney (2002) estimate HIV-related medication adherence rates at roughly seventy to eighty percent, even under hospital-supervised care. Among those with mental illness, and among racial/ethnic minority women, adherence rates are much lower, approximately sixty-five percent under the supervision of managed hospital care (DiMatteo et al., 2002; Wolf et al., 2007; Mannheimer et al., 2002). Moreover, adherence rates have been estimated to be even lower among PWID PLHIV, roughly fifty to sixty percent (Wolf et al., 2007). Therefore, even with formal care, PLHIV rates of medication adherence vary widely in the literature, and do not include distinctions of operationalization and measurement of HIV therapeutic adherence.

Additionally, measurement within, and between, each of these adherence domains varies. Lack of a gold standard of HIV medication adherence, therefore, encompasses a range of data collection methods. Viral suppression is often used as a proxy for medication adherence, as several clinical studies of virologic biomarkers and ART have established the predictive value of ART adherence on viral suppression (Chesney, 2006; Mannheimer et al., 2002; Howard et al., 2002; Paterson et al., 2000; DiMatteo et al., 2002). Self-report measures of medication adherence are also frequently utilized, partly due their relative accuracy and cost-effectiveness (National Collaborating Centre for Primary Care, 2009; Garfield, Clifford, Eliasson, Barber, & Willson, 2011).

Finally, studies of HIV medication adherence in recent years have also implemented a Medication Event Monitoring System, whereby an electronic bottle cap

records the number of bottle openings and the date and time (National Institutes of Health [NIH], 2014). Each of these approaches are valid measures of medication adherence (NIH, 2014; Garfield et al., 2011). Chesney (2006) purports that the more useful distinctions of HIV adherence are in research versus clinical implications, rather than therapeutic versus medication adherence implications. In this sense, the operationalization and measurement of adherence depends entirely on its application to address individual patient factors, literacy barriers, time and money constraints, and other relevant factors (Chesney, 2006).

In acknowledgment of the vast disparities in therapeutic adherence outcomes among PLHIV, the concept of an HIV "treatment cascade" denotes this spectrum. Specifically, Gardner, McLees, Steiner, del Rio, and Burman (2011) describe the treatment cascade as the process of HIV testing, linkage to care, initiation of effective ART, adherence to treatment, and retention in care. The CDC (2012) estimates that within the cascade, less than forty percent of PLHIV in the United States are prescribed ART and, among these individuals, only seventy-six percent have achieved viral suppression. Moreover, rates of therapeutic adherence are likely lower than those of medication adherence (Machtinger & Bangsberg, 2005). Similarly, overuse of acute care services is related to non-adherence among this population, as individuals whom report the Emergency Department as a usual source of care may be more likely to report lower linkage to care and effective ART (Unni, Ashment, Miller, & Draper, 2014).

In consideration of all of these concerns, the proposed study advocates the term "HIV medical adherence". Specifically, as mentioned, HIV medical adherence, was defined as both viral suppression and optimal acute care utilization. First, viral

suppression was defined as an HIV viral load of 40 copies per milliliter or less, measured by viral load assays (Schumacher et al., 2007). As mentioned, viral suppression is a widely accepted biomarker proxy of medication adherence (Chesney, 2006; Mannheimer et al., 2002; Howard et al., 2002; Paterson et al., 2000; DiMatteo et al., 2002).

The HIV Cost and Service Utilization Study (HCSUS) defines optimal HIV medical services utilization as prompt engagement in HIV care after diagnosis, minimal Emergency Department visits and inpatient care, and management of HIV illness through access to and use of ART (Shapiro et al., 1999; Fremont et al., 2007). In the present analyses, all of the participants were insured, and enrolled in primary care, and therefore should have had reduced need for acute care utilization. However, research suggests that optimal acute care utilization may be dependent on factors such as HIV illness stage, particularly among persons who inject drugs. Therefore, this focused on optimal acute care, defined as no Emergency Department visits or overnight hospitalizations in the prior six months. As such, HIV medical adherence is inclusive of viral suppression (medication adherence) and optimal acute care utilization (therapeutic adherence); both of which are meaningful constructs in research and clinical settings (Chesney, 2006).

SYNTHESIS AND CONCEPTUAL MODEL

Rationale for proposed study

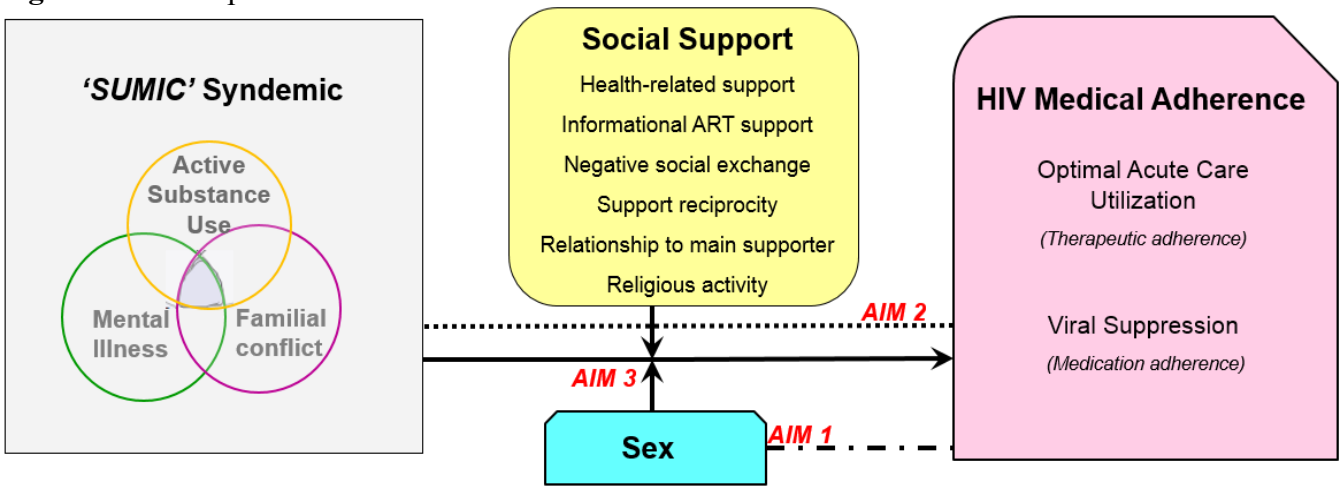
African-American drug-using populations are disproportionately affected by HIV infection and poor ART adherence, as compared to non-drug-using African-American PLHIV (CDC, 2010; CDC, 2012). In addition to HIV status, the syndemic factors of substance use, mental illness, and violence are common precursors to, and outcomes of,

HIV infection (Buseh & Stevens, 2008; Singer, 1996; Broadhead et al., 2002; Kelly & Kalichman, 2002; Holtgrave, 2004). Few studies have engaged persons who inject drugs and are persons living with HIV (PWID PLHIV) in research to identify possible means of intervention to improve ART adherence and outcomes.

Next, African-American women PLHIV are at highest risk of HIV infection due to less condom negotiation, less access to health care due to barriers such as lower educational attainment and non-insurance, and more strains on social support, compared to all other groups. Finally, adherence is controversial to define and measure, irrespective of its variation among PLHIV. Currently, there remains a dearth of research targeting HIV-positive African-Americans to identify their unique barriers and facilitators to engagement in optimal ART adherence, as well as medical adherence. Given the critical gaps in research within this population, the purpose of the proposed study was to identify correlates of HIV medical adherence among a sample of urban adult persons who inject drugs in Baltimore, Maryland.

CONCEPTUAL MODEL

Figure 2.1 Conceptual model



Conceptual model

Figure 2.1 depicts the conceptual model of the dissertation research. As mentioned, the *SUMIC* Syndemic was defined as current use of one or more illicit substances, diagnosis of one or more mental illnesses, and presence of familial conflict. Next, sex was a predictor of interest due to a substantial body of literature which suggests that women fare worse than men with HIV-related outcomes such as medical adherence. For the purposes of analyses, sex and gender were interchangeable terms. Third, social support was a central focus of the analyses, such that distinguishing types of social support as they relate to HIV medical adherence was crucial. While not depicted in the framework, relevant sociodemographic factors such as income level, educational attainment, and age were conceptualized and included in dissertation analyses.

Therefore, several dimensions of social support were included in analyses, ranging from ART-related support, health-related support from the PLHIV's social network, to support reciprocity from PLHIV to their informal caregiver. Finally, the outcome of interest was HIV medical adherence, defined as viral suppression and optimal acute care utilization. Additionally, the proposed study was unique in scope because it evaluated several dimensions of social support as predictive of HIV medical adherence, and gender-related differences in these dimensions. Finally, this study contributes an innovative approach to defining a latent syndemic of PLHIV. Previous literature has defined HIV syndemics based on gender or sexual practice, and predictive of primary HIV prevention. The proposed study contributes a race-considerate syndemic, focused on correlates of HIV tertiary prevention among already-infected PLHIV. Results have profound clinical and research implications.

REFERENCES

Aldworth, J., Barnett-Walker, K., Chromy, J., Karg, R., Morton, K., Novak, S., Spagnola, K. (2009). *Measuring serious mental illness with the NSDUH: Results of 2008 12-month analysis.* 2008 National Survey on Drug Use and Health: Methodological resource book/. RTI International: Research Triangle Park, NC.

Aral, S.O., Adimora, A.A., Fenton, K.A. (2008). Understanding and responding to disparities in HIV and other sexually transmitted infections in African-Americans. *Lancet*, 372, 337-40.

Baker, A., Kochan, J., Dixon, J., Heather, N., Wodak, A. (1994). Controlled evaluation of a brief intervention for HIV prevention among injection drug users not in treatment. *AIDS Care, 6*(5), 559-70.

Bakken, S., Holzemer, W.L., Brown, M.A., Powell-Cope, G.M., Turner, J.G., Inouye, J., Nokes, K.M., Corless, I.B. (2000). Relationships between perception of engagement with health care provider and demographic characteristics, health status, and adherence to therapeutic regimen in persons with HIV/AIDS. *AIDS Patient Care & STDS*, 14, 189-97.

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health,* 13, 623-49.

Barrow, R.Y., Newman, L.M., Douglas, J.M. (2008) Taking Positive Steps to Address STD Disparities for African-American Communities. *Sexually Transmitted Diseases*. *35*(12), S1-3.

Boulware, E.L., Cooper, L.A., Ratner, L.E., LaVeist, T.A., Powe, N.R. (2003). Race and trust in the health care system. *Public Health Reports,* 118, 358-65.

Broadhead, R.S., Heckathorn, D.D., Altice, F.L., van Hulst, Y., Carbone, M., Friedland, G.H., O'Connor, P.G., Selwyn, P.A. (2002). Increasing drug users' adherence to HIV treatment: results of a peer-driven intervention feasibility study. *Social Science & Medicine, 55*(2), 235-46.

Burke, L.E., Dunbar-Jacob, J. (1995). Adherence to medication, diet, and activity recommendations: from assessment to maintenance. *The Journal of Cardiovascular Nursing,* 9, 62-79.

Buseh, A.G, Stevens, P.E. (2008). Constrained But Not Determined by Stigma: Resistance by African-American Women Living with HIV. *Women & Health, 44*(3), 1-18.

Bussey, K., Bandura, A. (1999). Social cognitive theory of gender development and differentiation. *Psychological Review,* 106, 676-713.

Carrieri, F.R., Lewden, C., Sobel, A., Michelet, C., Cailleton, V., Chêne, G., Leport, C.,

Moatti, J.P., Spire, B., APROCO study group. (2003). Impact of early versus late adherence to highly active antiretroviral therapy on immuno-virological response: a 3-year follow-up study. *Antiviral Therapy*, 8, 585-94.

Celentano, D.D., Galai, N., Sethi, A.K., Shah, N.G., Strathdee, S.A., Vlahov, D., Gallant, J.E. (2001). Time to initiating highly active antiretroviral therapy among HIV-infected injection drug users. *AIDS, 15*(13), 1707-15.

Centers for Disease Control and Prevention [CDC]. (2005). Health Disparities Experienced by Black or African-Americans - United States. *MMWR: 54*(1), 1-3.

CDC. (2010). HIV/AIDS and women: For the public. *Retrieved August 5, 2014 from* http://www.cdc.gov/hiv/topics/women/ index.htm.

CDC. (2010). HIV/AIDS Surveillance Report, 2008. *Retrieved August 5, 2014 from* http://www.cdc.gov/hiv/surveillance/resources /reports/2008report/.

CDC. (2012). Linkage to and retention in HIV Medical Care. *Retrieved August 5, 2014 from* http://www.cdc.gov/hiv/prevention/ programs/pwp/linkage.html.

Chander, G., Himelhoch, S. Moore, R.D. (2006). Substance Abuse and Psychiatric Disorders in HIV-Positive Patients: Epidemiology and Impact on Antiretroviral Therapy. *Drugs, 66*(6), 769-89.

Chang, T.F. (2003). A structural model of race, gender, class, and attitudes toward labor unions. *Social Science Journal*, 40, 189-200.

Chesney, M.A. (2006). The elusive gold standard. Future perspectives for HIV adherence assessment and intervention. *Journal of Acquired Immune Deficiency Syndrome 43*(S1), S149-55.

Chesney, M.A., Folkman, S. (1994). Psychological impact of HIV disease and implications for intervention. *Psychiatric Clinics of North America,* 17, 163-82.

Coker, A.L., Watkins, K.W., Smith, P.H., Brandt, H.M. (2003). Social support reduces the impact of partner violence on health: Application of structural equation models. *Preventive Medicine, 37*(3), 259-67.

Connell, R.W. (1987). *Gender and Power.* Stanford University Press: Stanford, CA.

Cotton, S., Puchalski, C.M., Sherman, S.N., Mrus, J.M., Peterman, A.H., Feinberg, J., Pargament, K.I., Justice, A.C., Leonard, A.C., Tsevat, J. (2006). Spirituality and religion in patients with HIV/AIDS. *Journal of General Internal Medicine*, 21:5e13.

Cramer, J.A., Roy, A., Burrell, A., Fairchild, C.J., Fuldeore, M.J., Ollendorf, D.A., Wong,

P.K. (2008), Medication Compliance and Persistence: Terminology and Definitions. *Value in Health*, 11, 44-7.

Crane, H.M., Van Rompaey, S.E., Kitahata, M.M. (2006). Antiretroviral medications associated with elevated blood pressure among patients receiving highly active antiretroviral therapy *AIDS, 20*(7), 1019-26.

DiClemente, R.J., Wingood, G.M. (1995). A randomized controlled trial of an HIV sexual risk-reduction intervention for young African-American women. *JAMA, 274*(16), 1271-6.

DiMatteo, M.R., Giordani, P.J., Lepper, H.S., Croghan, T.W. (2002). Patient adherence and medical treatment outcomes: a meta-analysis. *Medical Care, 40*(9), 794-811.

Dreachslin, J.L., Weech-Maldonado, R., Dansky, K.H. (2004). Racial and Ethnic Diversity and Organizational Behavior: a Focused Research Agenda for Health Services Management. *Social Science & Medicine*, 59. 961-71.

Dunbar, J. (1990). Predictors of patient adherence: Patient characteristics. In S. A. Shumaker, E.B. Schron, & J.K. Ockene (Eds.). The handbook of health behavior change (pp. 348-360). New York, NY: Springer Publishing.

Dunlap, E., Golub, A., Johnson, B.D. (2006). The Severely-Distressed African-American Family in the Crack Era: Empowerment is not Enough. *Journal of Sociology & Social Welfare, 33*(1), 115-39.

Eaton, L., Flisher, A. J., Aarø, L. E. (2003). Unsafe sexual behavior in South African youth. *Social Science & Medicine*, 56, 149-65.

Edwards, L.V. (2006). Perceived Social Support and HIV/AIDS Medication Adherence among African-American Women. *Qualitative Health Research*, 16, 679-91.

El-Bassel, N., Caldeira N., Ruglass, L., Gilbert, L. (2009). Addressing the unique needs of African-American women in HIV prevention. *American Journal of Public Health, 99*(6), 996-1001.

Ehrhardt, A.A., Yingling, S., Zawadzki, R., Martinez-Ramirez, M. (1992). Prevention of heterosexual transmission of HIV: Barriers for women. *Journal of Psychology & Human Sexuality,* 5, 37-67.

Feaster, D.J., Brincks, A.M., Mitrani, V.B., Prado, G., Schwartz, S.J., Szapocznik, J. (2010). The Efficacy of Structural Ecosystems Therapy for HIV Medication Adherence with African-American Women. *Journal of Family Psychology, 24*(1), 51-9.

Fowler, D.N., Hill, H.M. (2004). Social support and spirituality as culturally relevant

factors in coping among African-American women survivors of partner abuse. *Violence Against Women, 10*(11), 1267-82.

Fremont, A., Young, A., Chinman, M., Pantoja, P., Morton, S.C., Koegel, P., Sullivan, J.G., Kanouse, D.E. (2007). Differences in HIV Care Between Patients with and Without Severe Mental Illness. *Psychiatric Services, 58*(5), 681-8.

Gardner, E.M., McLees, M.P., Steiner, J.F., del Rio, C., Burman, W.J. (2011). The spectrum of engagement in HIV care and its relevance to test-and-treat strategies for prevention of HIV infection. *Clinical & Infectious Diseases*, 52, 793-800.

Gaston, G.B., Alleyne-Green, B. (2013). The Impact of African-Americans' Beliefs About HIV Medical Care on Treatment Adherence: A Systematic Review and Recommendations for Interventions. *AIDS & Behavior*, 17, 31-40.

Gielen, A.C., McDonnell, K.A., O'Campo, P.J., Burke, J.G. (2005). Suicide risk and mental health indicators: Do they differ by abuse and HIV status? *Women's Health Issues,* 15, 89-95.

Garfield, S., Clifford, S., Eliasson, L., Barber, N., Willson, A. (2011). Suitability of measures of self-reported medication adherence for routine clinical use: A systematic review. *BMC Medical Research Methodology*, *11*(149), 1-9.

Glanz, K., Lewis, F.M., Rimer, B.K. (2002). Health Behavior and Health Education. 3rd ed. San Francisco, CA: Jossey-Bass Books.

Glass, N., Perrin, N., Campbell, J. C., Soeken, K. (2007). The protective role of tangible support on post-traumatic stress disorder symptoms in urban women survivors of violence. *Research in Nursing & Health, 30*(5), 558-68.

Goulet, J.L., Fultz, S.L., Rimland, D., Butt, A., Gibert, C., Rodriguez-Barradas, M., Bryant, K., Justice, A.C. (2007) Aging and infectious diseases: do patterns of comorbidity vary by HIV status, age, and HIV severity? *Clinical & Infectious Diseases 45*(12), 1593-1601.

Gullette, D.L., Wright, P.B., Booth, B.M., Stewart, K.E. (2010). Stages of Change, Decisional Balance, and Self-Efficacy in Condom Use Among Rural African-American Stimulant Users. *Journal of Associated Nurses AIDS Care, 20*(6), 428-41.

Hall, I., An, Q., Hutchinson, A., Sansom, S. (2008). Estimating the Lifetime Risk of a Diagnosis of the HIV Infection in 33 States, 2004–2005. *JAIDS, 49*(3), 294-7.

Harrison, P.M., Beck, A.J. (2005). Prisoners in 2004. *Retrieved August 12, 2014 from* http://www.kff.org.

Hartz, S.M., Pato, C.N., Medeiros, H., Cavazos-Rehg, P., Sobell, J.L., Knowles, J.A.,

Bierut, L.J., Pato, M.T. (2014). Comorbidity of Severe Psychotic Disorders With Measures of Substance Use. *JAMA Psychiatry,* 71(3), 248-54.

Herek, G.M., Capitanio, J.P., Widaman, K.F. (2002). HIV related stigma and knowledge in the United States: prevalence and trends, 1991–1999. *American Journal of Public Health*, 92, 371-7.

Heron, M. (2010) Deaths: Leading causes for 2006. *National Vital Statistics Reports, 58*(14), S1-30.

Holtgrave, D.R. (2004). HIV prevention, cost-utility analysis, and race/ethnicity: methodological considerations and recommendations. *Medical Decision Making, 24*(2), 181-91.

Hossain, M.B. Kippax, S. (2010). HIV-related discriminatory attitudes of healthcare workers in Bangladesh. *Journal of Health, Population, & Nutrition*, *28*(2), 199-207.

Howard, A.A., Arnsten, J.H., Lo, Y., Vlahov, D., Rich, J.D., Schuman, P., Stone, V.E., Smith, D.K., Schoenbaum, E.E., HER Study Group. (2002). A prospective study of adherence and viral load in a large multi-center cohort of HIV-infected women. *AIDS, 16*(16), 2175-82.

Jin, J., Sklar, G.E., Min Sen Oh, V.M., Li, S.C. (2008). Factors affecting therapeutic compliance: A review from the patient's perspective. *Therapeutics & Clinical Risk Management, 4*(1), 269–86.

Johnson, W.D., Diaz, R.M., Flanders, W.D., Goodman, M., Hill, A.N., Holtgrave, D., Malow, R., McClellan, W.M. (2008). Behavioral interventions to reduce risk for sexual transmission of HIV among men who have sex with men. *Cochrane Database of Systematic Reviews*, 3, CD001230.

Jones, C.P. (2000). Levels of Racism: A Theoretic Framework and a Gardener's Tale. *American Journal of Public Health,* 90, 1212-16.

Jones, D.J., Beach, S.R., Forehand, R., Foster, S.E. (2003). Self-Reported Health in HIV-Positive African-American Women: The Role of Family Stress and Depressive Symptoms. *Journal of Behavioral Medicine, 26*(6), 577-99.

Kaaya, S., Eustache, E., Lapidos-Salaiz, I., Musisi, S., Psaros, C., Wissow, L., (2013). Grand Challenges: Improving HIV Treatment Outcomes by Integrating Interventions for Co-Morbid Mental Illness. *PLOS Medicine, (10*)5: e1001447.

Kaiser Family Foundation. (2006). African-Americans and HIV/AIDS. *Retrieved August 1, 2014 from* http://www.kff.org.

Kaiser Daily Health Reports. (2006). President Bush's FY 2007 budget proposal would

reduce funding for CDC programs. Retrieved August 1, 2014, from http://www.kaisernetwork.org/daily_reports/print_report.cfm?DR_ID=36165&dr_cat=3.

Kalichman, S.C., Cherry, C., Brown, F. (1999). Effectiveness of a video-based motivational skills-building HIV risk-reduction intervention for inner-city African American men. *Journal of Consulting & Clinical Psychology*, 67, 959-66.

Kalichman, S.C., Rompa, D., (2003). HIV treatment adherence and unprotected sex practices in people receiving antiretroviral therapy. *Sexually Transmitted Infections*, 79, 59-61.

Kelly, J.A., Kalichman, S.C. (2002). Behavioral research in HIV/AIDS primary and secondary prevention: recent advances and future directions. *Journal of Consulting & Clinical Psychology, 70*(3), 626-39.

King, R. (1999). Sexual behavior change for HIV: Where have theories taken us? (Joint United Nations Programme on HIV/AIDS [UNAIDS]. *Retrieved August 6, 2014, from* http://www.unaids.org.

Knowlton, A.R., Arnsten, J.H., Eldred, L.J., Wilkinson, J.D., Shade, S.B., Bohnert, A.S., Yang, C., Wissow, L.S., Purcell, D.W. (2010). Antiretroviral use among active injection-drug users: the role of patient-provider engagement and structural factors. *AIDS Patient Care & STDS, 24*(7), 421-8.

Knowlton, A.R., Arnsten, J.H., Gourevitch, M.N., Eldred, L., Wilkinson, J.D., Rose, C.D., Buchanan, A., Purcell, D.W., INSPIRE Study Team. (2007). Microsocial environmental influences on highly active antiretroviral therapy outcomes among active injection drug users: the role of informal caregiving and household factors. *Journal of Acquired Immune Deficiency Syndrome, 46*(2), S110-9.

Knowlton, A.R., Latkin, C.A. (2007). Network financial support and conflict as predictors of depressive symptoms among a highly disadvantaged population. *Journal of Community Psychology, 35*(1), 13-28.

Knowlton, A.R., Latkin, C.A., Schroeder, J.R., Hooverm D.R., Ensminger, M., Celentano, D.D. (2001). Longitudinal predictors of depressive symptoms among low income injection drug users. *AIDS Care, 13*(5), 549-59.

Knowlton, A.R., Yang, C., Bohnert, A., Wissow, L., Chander, G., Arnsten, J.A., (2011). Main partner factors associated with worse adherence to ART among women in Baltimore, Maryland: a preliminary study. *AIDS Care, 23*(9), 1102-10.

Latkin, C.A., Forman, V., Knowlton, A., Sherman, S. (2002). Norms, social networks, and HIV-related behaviors among urban disadvantaged drug users. *Social Science & Medicine*, 56, 465-76.

LaVeist, T.A. (2005). Minority Populations and Health: An Introduction to Health

Disparities in the U.S., Jossey-Bass Books: San Francisco, CA.

Li, L., Ji, G., Ding, Y., Tian, J., Lee, A. (2012). Perceived burden in adherence of antiretroviral treatment in rural China. *AIDS Care, 24*(4), 502-8.

Lichtenberg, P.A., Brown, D.R., Jackson, J.S., Washington, O. (2004). Normative Health Research Experiences among African-American Elders. *Journal of Aging and Health,* 16, S78-92.

Machtinger, E.L., Bangsberg, D.R. (2005). HIV InSite: Adherence to HIV Antiretroviral Therapy. *Retrieved August 17, 2014 from* http://hivinsite.ucsf.edu/InSite?page=kb-03-02-09#S10X.

Maj, M., Janssen, R., Starace, F., Zaudig, M., Satz, P., Sughondhabirom, B., Luabeya, M., Riedel, R., Ndetei, D., Calil H., Bing, E.G., Louis St., M., Sartorius, N. (1994) WHO neuropsychiatric AIDS study, cross-sectional Phase-I - Study design and psychiatric findings. *Archives of General Psychiatry, 51*(1), 39-49.

Malebranche, D. (2005). Adverse health outcomes among Black Americans. *Positively Aware,* 11, 26-30.

Malmusi, D., Artazcoz, L., Benach, J., Borrell, C. (2011). Perception or real illness? How chronic conditions contribute to gender inequalities in self-rated health. *Retrieved August 4, 2014 from* http://www.citeulike.org/user/dmalmusi/author/Malmusi:D.

Malmusi, D., Borrell, C., Benach, J., (2010). Migration-related health inequalities: Showing the complex interactions between gender, social class, and place of origin. *Social Science & Medicine, 71*(9), 1610-9.

Mannheimer, S., Friedland, G., Matts, J., Child, C., Chesney, M. (2002). The consistency of adherence to antiretroviral therapy predicts biologic outcomes for human immunodeficiency virus-infected persons in clinical trials. *Clinical & Infectious Diseases, 34*(8), 1115-21.

Marmot, M.G. (2006). Status syndrome: a challenge to medicine. *JAMA,* 11, 1304-7.

McDaid, L.M, Hart, G. (2010). Sexual risk behaviour for transmission of HIV in men who have sex with men: recent findings and potential interventions. *Current Opinion in HIV & AIDS, 5*(4), 311-5.

Melkote, S.R., Muppidi, S.R., Goswami, D. (2000). Social and economic factors in an integrated behavioral and societal approach to communications in HIV/AIDS. *Journal of Health Communications*, 5, 17-27.

Metha, S., Moore, R.D., Graham, N. (1997). Potential factors affecting adherence with HIV therapy. *AIDS,* 11, 1665-70.

Minze, L.C., McDonald, R., Rosentraub, E.L., Jouriles, E.N. (2010). Making sense of

Family conflict: intimate partner violence and preschoolers' externalizing problems. *Journal of Family Psychology, 24*(1), 5-11.

Mosack, K.E., Petroll, A., (2009). Patients' Perspectives on Informal Caregiver Involvement in HIV Health Care Appointments. *AIDS Patient Care & STDS, 23*(12), 1043-51.

Muturi, K. (2008). Faith-Based Initiatives in Response to HIV/AIDS in Jamaica. *Retrieved August 1, 2014 from* http://ijoc.org/ojs/index.php/ijoc/article/viewFile /167/123.

National Collaborating Centre for Primary Care. (2009). Medicines adherence: Involving patients in decisions about prescribed medicines and supporting adherence. *Retrieved August 10, 2014 from* http://www.nice.org.uk/guidance/CG76.

National Institutes of Health [NIH]. (2014). Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents. *Retrieved August 6, 2014 from* http://aidsinfo.nih.gov/guidelines/html/1/adult-and-adolescent-arvguidelines /30/adherence-to-art

Newman, P.A., Williams, C.C., Massaquoi, N., Brown, M., Logie, C. (2008). HIV prevention for Black women: structural barriers and opportunities. *Journal of Health Care for the Poor & Underserved,* 19, 829-41.

Novak, S.P., Colpe, L.J., Barker, P.R., Gfroerer, J.C. (2010). Development of a brief mental health impairment scale using a nationally representative sample in the USA. *International Journal of Methods in Psychiatric Research, 19*(S1), 49-60.

Nunez-Smith, M., Curry, L.A., Bigby, J., Berg, D., Krumholz, H.M., Bradley, E.H. (2007). Impact of Race on the Professional Lives of Physicians of African Descent. *Annals of Internal Medicine,* 146, 45-51.

O'Connell, J.M., Braitstein, P., Hogg, R.S., Yip, B., Craib, K.J., O'Shaughnessy, M.V., Montaner, J.S., Burdge, D.R. (2003). Age, adherence and injection drug use predict virological suppression among men and women enrolled in a population-based antiretroviral drug treatment programme. *Antiviral Therapy*, 8, 569-76.

Office of Minority Health. (2006). HIV/AIDS and African-Americans. *Retrieved August 1, 2014 from* http://www.omhrc.gov/templates/content.aspx?ID=3019.

Owe-Larsson, B., Sall, L., Salamon, E., Allgulander, C. (2009) HIV infection and psychiatric illness. *African Journal of Psychiatry*, 12, 115-28.

Parker, R., Aggleton, P. (2003). HIV and AIDS-related stigma and discrimination: a conceptual framework and implications for action. *Social Science & Medicine, 57*(1), 13-24.

Parsons, S.K, Cruise, P.L., Davenport, W.M., Jones, V. (2006). Religious Beliefs,

Practices and Treatment Adherence Among Individuals with HIV in the Southern United States. *AIDS Patient Care & STDS, 20*(2), 97-111.

Paterson, D.L., Swindells, S., Mohr, J., Brester, M., Vergis, E.N., Squier, C., Wagener, M.M., Singh, N. (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Annals of Internal Medicine, 133*(1), 21-30.

Payne, M. (1997). *Modern social work theory: A critical introduction* (2nd ed.). Chicago, IL: Lyceum Publishing.

Pearlin, L., Semple, S., Turner, H. (1988). Stress of AIDS caregiving: A preliminary overview of the issues. *Death Studies, 12*(6), 501-17.

Prachakul, W., Grant, J.S., Keltner, N.L. (2007). Relationships among functional social support, HIV-related stigma, social problem solving, and depressive symptoms in people living with HIV: a pilot study. *Journal of the Association of Nurses of AIDS Care, 18*(6), 67-76.

Prejean, J., Song, R., Hernandez, A., Ziebell, R., Green, T., Walker, F., Lin, L.S., An, Q., Mermin, J., Lansky, A., Hall, H.I., HIV Incidence Surveillance Group. (2011). Estimated HIV Incidence in the United States, 2006-2009. *PLOS ONE 6*(8), e17502.

Reynolds, N.R., Testa, M.A., Marc, L.G., Chesney, M.A., Neidig, J.L., Smith, S.R., Vella, S., Robbins, G.K. (2004). Factors influencing medication adherence beliefs and self-efficacy in persons naive to antiretroviral therapy: a multicenter, cross-sectional study. *AIDS & Behavior, 8*(2), 141-50.

Robertson, M. (2006). Books reconsidered: Emile Durkheim, Le Suicide. *Australasian Psychiatry*, 14, 365-8.

Ross, M.W., Essien, E.J., Torres, I. (2006). Conspiracy beliefs about the origin of HIV/AIDS in four racial/ethnic groups. *Journal of Acquired Immune Deficiency Syndrome, 41*(3), 342-4.

Sanders-Phillips, K., (2002). Factors influencing HIV/AIDS in women of color. *Public Health Reports, 117*(S1), S151-6.

Schneider, J., Kaplan, S.H., Greenfield, S., Li, W., Wilson, I.B., (2004). Better Physician-Patient Relationships Are Associated with Higher Reported Adherence to Antiretroviral Therapy in Patients with HIV Infection. *Journal of General Internal Medicine, 19*(11), 1096-1103.

Schröder, K.E., Hobfoll, S.E., Jackson, A.P., Lavin, J. (2001). Proximal and Distal Predictors of AIDS Risk Behaviors among Inner-city African-American and European American Women. *Journal of Health Psychology, 6*(2), 169-90.

Schumacher, W.E., Frick, M. Kauselmann, V. Maier-Hoyle, R. van der Vliet, R., Babiel,

R. (2007). Fully automated quantification of human immunodeficiency virus (HIV) type 1 RNA in human plasma by the COBAS AmpliPrep/COBAS Taqman system. *Journal of Clinical Virology*, 38, 304-12.

Semple, S.J., Patterson T.L., Temoshok L.R., Straits-Tröster K., Atkinson J.H., Koch W., Grant, I. (1997). Family Conflict and Depressive Symptoms: A Study of HIV-Seropositive Men. *AIDS & Behavior, 1*(1), 53-60.

Senn, T.E., Carey, M.P. (2008). HIV, STD, and Sexual Risk Reduction for Individuals with a Severe Mental Illness: Review of the Intervention Literature. *Current Psychiatry Review, 4*(2), 87-100.

Shapiro, M.F., Morton, S.C., McCaffrey, D.F., Senterfitt, J.W., Fleishman, J.A., Perlman, J.F., Athey, L.A., Keesey, J.W., Goldman, D.P., Berry, S.H., Bozzette, S.A. (1999). Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. *JAMA, 281*(24), 2305-15.

Shearer, H.M., Evans, D.R. (2001). *Adherence to health care.* In S.S. Kazarian and D. R. Evans (Eds.). Handbook of Cultural Health Psychology. (pp. 113-38). San Diego, CA: Academic Press.

Singer, M. (1996). A dose of drugs, a touch of violence, a case of AIDS: Conceptualizing the SAVA syndemic. *Free Inquiry in Creative Sociology, 24*(2), 99-110.

Strine, T.W., Chapman, D.P., Balluz, L., Mokdad, A.H. (2008). Health-related quality of life and health behaviors by social and emotional support. *Social Psychiatry and Psychiatric Epidemiology, 43*(2), 151-9.

Substance Abuse and Mental Health Services Administration (2013). *Results from the 2012 National Survey on Drug Use and Health: Mental Health Findings*, NSDUH Series H-47, HHS Publication No. (SMA) 13-4805. Substance Abuse and Mental Health Services Administration: Rockville, MD.

Thornburn-Bird, S., Bogart, L.M. (2005). Conspiracy beliefs about HIV/AIDS and birth control among African-Americans: implications for the prevention of HIV, other STIs, and unintended pregnancy. *Journal of Social Issues, 61*(1), 109-26.

Tobias, C., Cunningham, W.E., Cunningham, C.O., Pounds, M.B. (2007). Making the connection: the importance of engagement and retention in HIV medical care. *AIDS Patient Care& STDS, 21*(S1), S3-8.

Tobin, K.E., Kuramoto, S.J., Davey-Rothwell, M.A., Latkin, C.A. (2011). The STEP into Action study: a peer-based, personal risk network-focused HIV prevention intervention with injection drug users in Baltimore, Maryland. *Addiction, 106*(2), 366-75.

Tucker, J.S., Burnam, M.A., Sherbourne, C.D., Kung, F.Y., Gifford, A.L. (2003). Substance use and mental health predictors of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *American Journal of Medicine, 114*(7), 573-80.

Turner, B.J., Laine C., Cosler L., Hauck W.W. (2003). Relationship of gender, depression, and health care delivery with antiretroviral adherence in HIV-infected drug users. *Journal of General Internal Medicine*, 18, 248-57.

Unni, E.J., Ashment, R., Miller, E., Draper, A.M. (2014). Medication non-adherence in the homeless population in an Intermountain West city. *Innovations in Pharmacy, 5*(2), 1-10.

United Nations Population Fund [UNFPA]. (2002). Fast Facts on Gender Issues: Gender-based Violence. *Retrieved August 4, 2014 from* http://www.unfpa.org/gender /facts.htm.

U.S. Census Bureau. (2011). Educational Attainment in the United States: 2008. *Retrieved August 16, 2014 from* http://www.census.gov/population/www/s ocdemo/education/cps 2008.html.

United States Department of Veteran Affairs. (2011). Substance Use – Primary Care of Veterans with HIV, Behavior and Prevention. *Retrieved August 4, 2014 from* http://www.hiv.va.gov/provider/manual-primary-care/substance-use.asp.

Vitiello, B., Burnam, M.A., Beckman, R., Shapiro, M.F. (2003). Use of psychotropic medications among HIV-infected patients in the United States. *American Journal of Psychiatry*, 160, 547-54.

Wagner, G. Rabkin, J. (2000). Measuring medication adherence: are missed doses reported more accurately than perfect adherence. *AIDS Care,* 12**,** 405-8.

Washington, H.A. (2006). *Medical apartheid: the dark history of medical experimentation on Black Americans from colonial times to the present*. New York, NY: Doubleday Publishing.

Wolf, M.S., Davis, T.C., Osborn, C.Y., Skripkauskas, S., Bennett, C.L., Makoul, G. (2007). Literacy, self-efficacy, and HIV medication adherence. *Patient Education & Counseling, 65*(2), 253-60.

Wingood, G.M., DiClemente, R.J. (2000). Application of the theory of gender and power to examine HIV-related exposures, risk factors, and effective interventions for women. *Health Education & Behavior, 27*(5), 539-65.

Woodward, A.T., Taylor, R.J., Bullard, K.M., Neighbors, H.W., Chatters, L.M., Jackson, J.S. (2008). Use of Professional and Informal Support by African-Americans and Caribbean Blacks with Mental Disorders. *Psychiatric Services, 59*(11), 1292-8.

Wyatt, G.E. (2002). Does a history of trauma contribute to HIV risk for women of color? Implications for prevention and policy. *American Journal of Public Health*, *92*(4), 660-5.

Zea, M., Reisen, C., Poppen, P., Bianchi, F., Echeverry, J. (2005). Disclosure of HIV status and psychological well-being among Latino gay and bisexual men. *AIDS & Behavior, 9*(1), 15-26.

Zierler, S., Krieger, N. (1997). Reframing Women's Risk: Social Inequalities and HIV Infection. *Annual Review of Public Health,* 18, 401-36.

CHAPTER THREE: METHODOLOGY

BACKGROUND

Parent study

This study utilized baseline data from a NIH-funded study entitled "Being Active and Connected: Informal Caregiving and Medical Adherence among HIV+ Injection Drug Users" (BEACON) (Principal Investigator (PI): Amy Knowlton, ScD). The parent project was a longitudinal study which explored pathways through which psychosocial factors and substance use influence HIV-related outcomes among HIV-positive current and former injection drug users.

The BEACON study examined the role of social support in inner city drug users' successful HIV treatment, and social network and informal HIV caregiving research after the advent of highly active antiretrovirals. The proposed dissertation research sought to identify correlates of HIV medical adherence. The findings will inform subsequent interventions to ultimately improve HIV health outcomes among PLHIV.

STUDY AIMS AND HYPOTHESES

Study aims and hypotheses

The purpose of the proposed study was to identify correlates of HIV medical adherence among a sample of urban adult persons who inject drugs in Baltimore, Maryland. As previously depicted in Figure 2.1, the study's aims were to:

1) understand the association between sex and HIV medical adherence (defined as optimal acute care utilization and ART adherence) among a sample of urban African-American adult persons who inject drugs currently engaged in HIV medical care;

2) determine the relationship between the *'SUMIC'* Syndemic (e.g. ***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict), and HIV medical adherence among a sample

of urban African-American adult persons who inject drugs currently engaged in HIV medical care;

3) examine sex and social support as potential moderators in the relationship between the *SUMIC* Syndemic and HIV medical adherence among a sample of urban African-American adult persons who inject drugs engaged in HIV medical care.

Study hypotheses

The proposed dissertaion had also three hypotheses:

1) Females would report lower rates of HIV medical adherence than males;

2) Individuals with higher *SUMIC* Syndemic burden would report lower rates of medical adherence as compared to individuals who had lower syndemic burden; and

3) Females would report higher levels of the *SUMIC* Syndemic and lower rates of medical adherence as compared to males.

POPULATION AND DATA SOURCES

Study population, data sources, and data collection

The BEACON parent study examined the role of psychosocial factors, sex, and active drug use on HIV health outcomes among disadvantaged PLHIV. The BEACON study built on previous research within prior studies on the influence of social networks and social support on health outcomes including substance use and mental illness among similar disadvantaged groups (Knowlton & Latkin, 2007). The project goals were to:

(a) understand influences of social support networks and informal caregivers ("main supporters") on ART adherence and medical services among the target population;

(b) utilize study findings to inform the development and implementation of interventions to increase ART adherence among the target population.

Study participants were HIV-positive former and current substance users (Indexes) and their main HIV-related supporters who were recruited to the study. All participants (e.g. Indexes and main supporters) completed baseline (Time 1), a 6-months follow-up assessment (Time 2), and 12-months follow-up assessment (Time 3). Plasma viral load, CD4 count data, and toxicology tests were collected at baseline and 6 month visits for all Index participants. The present study utilized data from a total of 383 Indexes, who completed baseline data collection for the BEACON study.

Inclusion criteria for Indexes were: (a) age of 18 years or older; (b) documented HIV seropositive status; (c) current or former injection drug use; and (d) current use of ART medication defined as use in the prior 30 days. Participants were recruited through street outreach through the PI's research center, the Lighthouse housed within the Johns Hopkins Bloomberg School of Public Health but located off-campus. Indexes were recruited using community sampling, and targeted recruitment strategies that were utilized successfully by the PI in previous interventions and studies. Index participants were also recruited via the Johns Hopkins University's Moore Clinic, an HIV-specialty clinic located in Baltimore, Maryland. Finally, main supporters were identified by Indexes, and invited to participate in the study.

Only data provided from Indexes were included in this study. Participants used audio-computer-assisted self-interviewing procedures (ACASI) to complete the sensitive topic items of the surveys, such as drug use, ART adherence, and history of mental illness.

Data on other survey topics were collected in face-to-face interviews using Questionnaire Development System (QDS) computer programmed survey instruments (Nova Research Company, 2006). Trained interviewers with extensive experience working with the study population conducted interviews at the Lighthouse research facility. All interviewers who administered assessments were trained in conducting research with vulnerable populations and sensitive subject matter, and trained staff also collected all biomarker data from Index participants.

STUDY VARIABLES

Operationalization of predictor variables

Active substance use (syndemic factor)

Inclusion criteria for the BEACON study specified that all Index participants endorse former or current injection drug use. Therefore, participants were classified as active substance users if they reported having used any of the following substances in the past 30 days: alcohol, stimulants, opiates, barbiturates, heroin, cocaine/crack, hallucinogens, or prescription drugs. Principal component factor analyses were conducted to assess the factor structure and internal reliability of the items. Six of the items were retained, with a one-factor solution. The items retained assessed opiates, marijuana, heroin, cocaine/crack, hallucinogens, and prescription drug use in the last 30 days. Binary items were created for each of the six substance use items, and summed to create a scale in order to assess the internal consistency of the items. Factor analyses was conducted to account for a latent factor structure and binary items, which yielded acceptable fit (Chi-square [χ^2] = 11.37; Degrees of freedom [df] = 9; Root Mean Square Error of Approximation [RMSEA] = 0.03; Comparative Fit Index [CFI] = 1.00; Rasch, 1980).

These items were summed, and ranged from 0 to 6. Items were used in both Poisson regressions and latent class regression analyses (Chapter Four, Chapter Five, Chapter Six and Appendix A).

Mental illness (syndemic factor)

Participants were classified as having mental illness if they responded 'yes' to any of the following: (a) "Have you ever received any counseling, therapy, or medication for your nerves or any emotional problems, not including drug treatment?"; (b) "Have you been told by a doctor or other health care provider that you have depression or major depression?"; (c) "Have you been told by a doctor (or other health care provider) that you have manic depression or bipolar disorder?"; (d) "Have you been told by a doctor (or other health care provider) that you have anxiety, panic attacks, or post-traumatic stress disorder (PTSD)?"; (e) "Have you been told by a doctor (or other health care provider) that you have schizophrenia or psychosis, that is, hearing voices or seeing things that aren't there?"; (f) "Have you been told by a doctor (or other health care provider) that you have any other emotional or psychiatric conditions?" Binary items were created for each of the six items, and summed. Factor analyses was conducted to account for a latent factor structure and binary items, which yielded acceptable fit with items (b) through (f), and a one-factor solution (χ^2 = 2.41; df = 5; RMSEA = 0.00; CFI = 1.00). Responses ranged from 0 to 5. These items were used in both Poisson regression and latent class regression analyses (Chapter Four, Chapter Five, Chapter Six, and Appendix A).

Familial conflict (syndemic factor)

Familial conflict will be assessed via a measure adapted from the Conflict Tactics Scale, which assesses constructs of intra-family aggression, violence, and conflict

resolution (Straus, 1979). Sample survey items include, “In my family when we are angry or upset we don't talk to each other”, and “In my family if someone is having problems, other family members get too involved, they meddle in their business”. Due to data missingness, three of the items were retained, with a one-factor solution. The items retained were: (a) “In my family we talk about our problems with each other”, (b) “In my family if someone has a problem, we work together to deal with it” and (c) “In my family we show that we care for each other.”

Each item had a 5-point Likert scale ranging from “Strongly Agree” to “Strongly Disagree”. Binary items were created for each of the three items, and summed to create a scale. Factor analyses was conducted to account for a latent factor structure and binary items, which yielded acceptable fit (χ^2 = 0.00; df = 0; RMSEA = 0.00; CFI = 1.00). These items were used in Poisson regressions and latent class regression analyses (Chapter Four, Chapter Five, Chapter Six, and Appendix A). Previous research defines familial conflict as any any disagreements between family members; thus the present items were conceptualized are reflective of this operationalization (Semple, Strathdee, Zians, & Patterson, 2009).

SUMIC Syndemic (latent class)

For the purposes of multivariate Poisson regression, the individual scales were categorized. For substance use, the six binary items were summed, and ranged from 0 to 6, where higher scores indicated higher concurrent substance use. Due to low responses rates in each category, categories were collapsed, such that 0 = no substances used, 1 = 1-2 substances used, and 3 = 3-6 substances used. For mental illness items, the five binary items of participants’ use of each substance were summed, and ranged from 0 to 5, where

higher scores indicated higher concurrent substances used. Due to low responses rates in each category, categories were collapsed, such that 0 = no mental illness diagnoses, 1 = 1-2 mental illness diagnoses, and 2 = 3-5 mental illness diagnoses.

Familial conflict scores ranged from 0 to 3, where higher scores indicated higher endorsement of familial conflict (e.g. low endorsement of family problem solving and/or affection). Categories were retained for each of the scores. As mentioned, separate structural equation measurement models were fit for each syndemic factor, to account for their underlying latent structure prior to latent class regression analyses (Chapter Five and Appendix A). Finally, the syndemic classes were used as a categorical predictor in Poisson regression analyses where HIV medical adherence was the outcome of interest (Chapter Six).

Social support

Due to the importance of distinguishing between types of social support and their associations with HIV medical adherence, several dimensions of social support were operationalized and analyzed.

1. Health-related support - Health-related support refers to supportive persons that Index PLHIV have whom assist them in engagement in health-related behaviors. The items were developed based on the Arizona Social Support Inventory (Barrera, Jr. & Gottlieb, 1981), and has proven a valid measure in previous studies with similar populations (Latkin et al., 1996). Items included “In the last year, has anyone gone with you to a doctor's appointment or to the ER to get medical care?”; “In the last year, has anyone

brought or prepared food or cleaned for you?"; "In the last year, has anyone run errands for you, for example, picked up medicine or gone shopping for you?"; and "In the last year, has anyone helped you with your medication?" Principal component factor analyses were conducted to assess the factor structure and internal reliability of the items. All six items were retained with a one-factor solution, with good reliability (Cronbach's $\alpha = 0.81$). Cronbach's alpha is mathematically equivalent to KR-20 for dichotomous data, therefore Cronbach's alpha was used computationally (Tan, 2009). Due to the binary nature of the data and skewed distribution of responses, responses were dichotomized at the median, where 0 = low health-related support, and 1 = high health-related support (MacCallum, Zhang, Preacher, & Rucker, 2002).

2. ART-related support - ART-related support was assessed by a single item which asked participants "How often does your main supporter talk to you about your HIV medications or side effects?" The single item was a useful variable to include in analyses, to identify specific main supporter behaviors that may impact HIV medical adherence among Indexes. The item was also developed and informed by the Arizona Social Support Inventory (Barrera, Jr. & Gottlieb, 1981), and previous research with similar populations (Latkin et al., 1996). Responses were on a 4-point Likert scale, ranging from "Never" to "Very often". Responses were trichotomized at the tertiles where 0 = low ART-related support, and 1 = moderate ART-related support, and 2 = high ART-related support (Fong, 2014).

3. Negative social exchange - Negative social exchange refers to interpersonal events or stressors, such as unwanted advice, or experiencing others' insensitive behaviors (Newsom, Nishishiba, Morgan, Rook, & 2003). The scale, based on Newsom et al.'s (2003) scale consisted of nineteen items, including "In the past 30 days, how often did someone you know let you down when you needed help?"; "In the past 30 days, how often did someone you know fail to spend enough time with you?"; and "In the past 30 days, how often did you feel that someone you know was not paying enough attention to you?" Participants' responses were on a 3-point Likert scale, ranging from "Rarely or none of the time" to "Most or all of the time". Principal component factor analyses were conducted to assess the factor structure and internal reliability of the items. Thirteen of the items were retained with a one-factor solution, with good reliability (Cronbach's $\alpha = 0.80$). Due to the categorical nature of the data and skewed distribution of responses, responses were dichotomized and/or trichotomized for subsequent analyses (Chapter Four and Chapter Six; MacCallum et al., 2002).

4. Reciprocity of support - Based on the scale by Pearlin, Mullan, Aneshensel, and Wardlaw (1994), informal caregiver reciprocity refers to the activities that Indexes reported providing to their main supporters in the past 12 months. The nine items include "How much have you helped your main supporter around the house in the past year?"; "How much have you cared for your main supporter's children, family, or friends in the past year?"; and "How much have you expressed affection and appreciation for your main

supporter in the past year?" Participants' responses were on a 3-point Likert scale, ranging from "None" to "A lot". Principal component factor analyses were conducted to assess the factor structure and internal reliability of the items. Seven items were retained with a one-factor solution, with acceptable internal consistency (Cronbach's $\alpha = 0.78$). Responses were trichotomized at the tertiles, where 0 = low reciprocity, 1 = medium reciprocity, and 2 = high reciprocity (Fong, 2014).

5. Relationship to main supporter - Main supporter relationship was assessed by a single item which asked Indexes what their relationship was to the most supportive person to them. Responses were recoded as: "Kin (Older generation, same generation, or younger generation)"; "Main Partner (Significant other)", "Friend"; and/or "Professional". Due to a skewed distribution of responses, categories were collapsed, such that 0 = other main supporter (Professional, friend, or no main supporter identified), 1 = main partner (Significant other), and 2 = kin (Older, same, or younger generation). This item was useful for assessing whether associations with Indexes' HIV medical adherence differed, based on the Index's relation to their informal caregivers (Chapter Four, Chapter Five, Chapter Six, and Appendix A).

6. Religious activity - Religious activity was assessed by a single item which asked "How often do you go to religious services?" Responses were on a 6-point Likert scale, ranging from "Never" to "More than once a week". Due to a skewed distribution of responses, categories were collapsed and trichotomized at the tertiles, such that 0 = low attendance, 1 = moderate

attendance, 2 = frequent attendance (Fong, 2014). This item was useful for assessing whether difference existed in Indexes' HIV medical adherence, based on their engagement in organizational religious services. Research suggests many PLHIV belong to an organized religion, and use their religion to cope with their illness, which may predict higher HIV medical adherence, thereby justifying inclusion of this item in analyses as a form of organizational support (Chapter Four; Cotton et al., 2006).

HIV stigma

HIV-related stigma refers to perceived discrimination or judgment that PLHIV may experience and/or internalize, based on their HIV seropositivity (Wight, Aneshensel, Murphy, Miller-Martinez, & Beals, 2006). Participants completed nine items based on the scale by Wight et al (2006), including, "Thinking about having HIV, how much do you feel that you need to hide it?"; "Thinking about having HIV, how much do you feel that people think that it's not such a big deal?"; and "Thinking about having HIV, how much do you fear your family will reject you?" Responses were on a 4-point Likert scale, ranging from "Not at all" to "Very much". Principal component factor analyses were conducted to assess the factor structure and internal reliability of the items. Six items were retained with one factor and acceptable reliability (Cronbach's $\alpha = 0.75$). Due to the categorical data and distribution of responses, responses were trichotomized at the tertiles, where 0 = low stigma, 1 = medium stigma, and 2 = high stigma (Fong, 2014).

Doctor-patient communication

Doctor-patient communication was assessed by a ten-item scale based on the Engagement with Healthcare Provider Scale (Bakken et al., 2000). These items assess

patient-provider communication and patient satisfaction, and includes items such as "My doctor involves me in decisions", "My doctor knows me as a person"; and "My doctor respects my choices." Responses were on 4-point Likert scale, ranging from "Never" to "Always". Principal component factor analyses were conducted to assess the factor structure and internal reliability of the items. Nine items were retained with a one-factor solution, with good reliability (Cronbach's $\alpha = 0.86$). Responses were dichotomized at the median, where 0 = low patient/provider communication and1 = high patient/provider communication (MacCallum et al., 2002). Bakken et al. (2000) found that better patient-provider communication was associated with increased HIV medical adherence among PLHIV, thereby justifying its inclusion in analyses (Chapter Four and Chapter Six).

Physical functioning/activities of daily living (ADLs)

Physical health (physical functioning and ADLs) was assessed by a ten-item scale based on the Medical Outcomes Study Physical Functioning Measure (McDowell& Newell, 1996). These items included "How much does your health affect your ability to bend, lift, or squat down?"; "How much does your health affect your ability to do moderate activities like moving a table, carrying groceries, or walking a mile?"; and "How much does your health affect your ability to eat, dress, or bathe?" Responses were on 3-point Likert scale, ranging from "Not at all" to "A lot". Items were reverse-scored, such that higher scores indicated higher levels of physical functioning, rather than physical limitations. Next, principal component factor analyses were conducted to assess the factor structure and internal reliability of the items.

Nine of the ten items were retained with a one-factor solution, with acceptable reliability (Cronbach's $\alpha = 0.77$). Responses were trichotomized at the tertiles, where 0 =

low physical functioning, 1 = moderate physical functioning, and 2 = high physical functioning (Fong, 2014). Included in analyses are self-reports of both mental and physical health, as both are associated with HIV medical adherence (Burgess, Dayer, Catalan, Hawkins, & Gazzard, 1993; Batchelder, Gonzalez, & Berg, 2014).

Sociodemographic variables

The following demographic variables were included in analyses: educational attainment, sex, and age, each of which were assessed by single items. Relevant variables were summarized for each analysis (Chapter Four, Chapter Five, Chapter Six).

Operationalization of outcome variables

HIV medical adherence

HIV medical adherence was defined as both level of optimal acute care utilization and HIV viral suppression (Figure 2.1). Also included in analyses was *SUMIC* Syndemic class as an outcome variable (Chapter Five).

1. Optimal acute care utilization - Optimal acute care utilization was measured as a cumulative score of access to health care services and level of engagement in acute HIV medical services. This definition of optimal acute care utilization is based on The HIV Cost and Service Utilization Study terminology (e.g., minimization of acute care; Shapiro et al., 1999; Fremont et al., 2007). Respondents were asked the following six questions: (a) "Where do you usually go for health care? What type of facility is it?"; (b) "Enter the [name of the place]"; (c) "In the past 6 months, how many times have you gone to an emergency room (ER) for your health care?"; (d) "In the past 6 months, other than

an emergency room, how many times have you seen a health care provider to get medical care for yourself?"; (e) "In the past 6 months, how many times were you admitted to a hospital, that means that you stayed there overnight?"; and (f) "In the past 6 months, how many nights did you stay at a hospital? This could include for drug detox or mental health care."

Respondents entered a text (nominal) response to items (a) and (b), and numeric responses to questions (c) through (f), therefore only numeric responses were considered for inclusion in analyses. Given that Indexes were all enrolled in care, and had insurance, and attended the same clinic, there was little variation in their responses, Therefore, items (c) and (e) were retained for analyses as an outcome measure, and dichotomized at the median, where 0 = 1 or more ER visits and/or overnight hospitalizations in the last 6 months, and 1 = 0 ER visits or overnight hospitalizations in the last 6 months (MacCallum et al., 2002). Optimal acute care utilization was conceptualized as a behavioral proxy for therapeutic adherence of Indexes, nearly all of whom were insured and should have had little reason to access acute care services such as the ER.

2. HIV viral suppression - HIV viral suppression was defined as an undetectable viral load of 40 copies per milliliter (mL) or less, as measured by the Roche Cobas Amplicor viral load assay (Schumacher et al., 2007). Viral suppression is generally accepted as a standard measure of medication adherence (Chesney, 2006). Therefore, a dichotomous variable of viral suppression was constructed, where 0 = detectable viral load, and 1 = non-detectable viral load, or viral suppression ($\leq$ 40 copies/mL).

While pill counts were also available in the present dataset, controversy persists over what defines an acceptable cut-off rate of "adherence" (Steel, Nwokike, Joshi, & 2007; Fairley, Permana, & Read, 2005). Therefore, viral suppression is a commonly accepted biomarker proxy of medication adherence (Chapter Two; Chesney, 2006; Mannheimer et al., 2002; Howard et al., 2002; Paterson et al., 2000; DiMatteo et al., 2002).

3. *SUMIC* Syndemic class membership - While the outcome of interest was HIV medical adherence, latent class analyses (LCA) were conducted to identify unique patterns of behavioral risk, as identified by Indexes' active substance use, mental illness(es), and levels of familial conflict. LCA can be used as a data reduction technique by which to categorize individuals into their most likely class membership along the spectrum of the *SUMIC* Syndemic. (e.g. non-observable latent variable, based on latent conditions such as substance use and mental illness; Ahn et al., 2008; Bastard at al., 2011; Collins & Lanza, 2010). Therefore, the *SUMIC* Syndemic latent classes were participants' most likely membership classes, based on their posterior probability of endorsing the previously identified 14 items included in analyses (Ahn et al., 2008; Collins & Lanza, 2010).

In addition, the syndemic classes were also treated as a categorical outcome variable in LCA regression based on three relevant correlates: sex, viral suppression, and optimal acute care utilization. In this light, comparisons were made about class membership as a function of sex and HIV medical adherence. Therefore, class membership was treated as both a predictor and an outcome, which was a decision that was theoretically based, and has direct implications for future research and interventions

(Chapter Two and Chapter Six; Ahn et al., 2008; Bastard at al., 2011; Collins & Lanza, 2010; Chesney, 2006; DiClemente & Wingood, 1995; Bussey & Bandura, 1999). Finally, all of the analyses of interest were conducted to predict HIV medical adherence among African-Americans. Therefore descriptive and univariate statistics were run on the full sample (*N*=383), while bivariate and multivariate analyses were run solely on the subset of African-American participants (*N*=351), for both statistical and theoretical relevance to research aims and hypotheses.

STATISTICAL ANALYSES FOR RESEARCH AIMS

Statistical analyses to address research aims

Research Aim 1. Association between sex and HIV medical adherence

In order to assess the association between sex and HIV medical adherence, descriptive analyses were conducted. First, univariate frequencies of demographic characteristics of participants were run on the entire sample, and also by sex. (Tables 4.1. 5.1, and 6.1). Demographic characteristics of interest included: race (African-American/White/Other), sex (male/female), education (8^{th} grade or less/some high school/high school or GED/some college or above), and age (numerical).

All variables except age were categorical, and descriptive summaries were examined to assess the distribution of responses for each. Categories were collapsed as necessary, to account for skewed distributions and/or missing data. Finally, the outcome variables were dichotomized from continuous variables (age, service utilization, and viral suppression), for regression analyses (Chapter Six).

Hypothesis 1.1. Females would have lower HIV medical adherence than males.

In order to test this hypothesis, Chi-square analyses were conducted to determine statistically significant associations between each of the demographic variables (other than sex), HIV medical adherence, and sex (Table 4.1). Variables that were marginally significant ($p<.10$) and/or statistically significant ($p<.05$) were retained and included in subsequent multivariate Poisson regression models run separately by sex (Gordon, 2012; Chapter Four). For Poisson regression analyses by sex, viral suppression was retained as an outcome variable.

Poisson regression is appropriate for binary outcome data for non-rare events (McNutt, Wu, Xue, & Hafner, 2003). To account for heteroskedasticity (inconstant variation), robust standard errors were estimated (Long, 1997). This decision was based on the higher number of significant associations at the bivariate level, as compared to optimal acute care utilization. Chapter Four summarizes sex differences in correlates of viral suppression only. Relevant tests of interaction effects were assessed.

Research Aim 2. Association between the '*SUMIC*' Syndemic, social support, and HIV medical adherence

As mentioned, syndemic risk was assessed via construction of a categorical variable indicating number of factors for each Index. Associations between these factors and medical adherence were assessed with Chi-square analyses. These analyses are summarized in Appendix A. Next, factor analyses were conducted to assess the latent factor structure of all three factors (e.g. substance use, mental illness, familial conflict).

After testing first-order measurement models per factor, second-order factor measurement models were tested. All second-order measurement model combinations

were assessed: (a) substance use/mental illness/familial conflict; (b) substance use/mental illness; (c) substance use/familial conflict; and (d) mental illness/ familial conflict. Latent class analyses were decided upon, due to poor fit of the second-order models.

As such, LCA regression identified syndemic classes, and also correlates of syndemic class membership (sex and HIV medical adherence; Chapter Five). After LCA regression analyses, multivariate Poisson regression with robust standard errors was conducted, with syndemic class membership as a categorical predictor, and HIV medical adherence (binary viral suppression and optimal acute care utilization), as detailed in Chapter Six. Based on findings by Israelski, Gore-Felton, Power, Wood, and Koopman (2001) and Mills et al. (2006), the following sociodemographic variables were included in analyses as potential confounders and controlled for: (a) educational attainment; (b) income; and (c) age. Due to lack of statistical variation, race was excluded as a control variable. Instead, analyses were conducted only on African-American Indexes.

Hypothesis 2.1 Individuals within higher *SUMIC* Syndemic burden would report lower rates of HIV medical adherence as individuals with lower Syndemic burden.

Chapter Five details the results of these analyses. After factor analyses, first-order, and second-order measurement models, latent class analyses were conducted. This decision was made due to poor fit of the second-order measurement models, such that syndemic factors were unable to be combined reliably. This hypothesis was alternatively assessed utilizing Chi-square tests and categorical variables of Indexes' active substance use, mental illness, and familial conflict. It was decided that treating each factor as a categorical count variable was inadequate for two main reasons, thus it was not included

in final analyses in manuscript chapters, and instead summarized in Appendix A.

First, a simple count of each substance use, mental illness, and familial conflict (absence/presence as defined by inclusion of any endorsement per factor) does not detail important variations within each factor such as the most commonly used substance and/or most prevalent mental illness. Second, summing all factors as one categorical syndemic variable does not differentiate absence or presence of *each* factor(s); it simply identifies absence/presence of *some* factor(s). Therefore, each factor was summed separately as a scale, and used as separate categorical correlates of viral suppression in Chapter Four. LCA analyses utilizing *SUMIC* Syndemic classes as an outcome are detailed in Chapter Five, and syndemic classes as a categorical predictor are detailed in Chapter Six.

Research Aim 3. Assess sex and social support as potential moderators in the relationship between the *SUMIC* Syndemic and HIV medical adherence

As mentioned, descriptive frequencies of the outcome variable and predictor variables were calculated (Tables 4.1. 5.1, and 6.1). Next, bivariate associations were conducted between all categorical correlates and the outcome variables (Chi-square). In order to assess age as a potential confounding variable, it was dichotomized as a binary variable and assessed for statistical association with HIV medical adherence in the multivariate Poisson regression models. Associations that were marginally significant ($p<.10$) and/or statistically significant ($p<.05$) were entered in subsequent Poisson regression models (Gordon, 2012).A backwards deletion approach was employed, in order to trim the resulting model to include only statistically significant correlates, and/or

those theoretically relevant to the specific analyses. Therefore, all social support variables and sex were included in analyses, despite non-significant associations.

Hypothesis 3.1. Females would report higher rates of the *SUMIC* Syndemic and lower rates of medical adherence as compared to males.

The aforementioned multivariate Poisson regression models were specified to regress HIV medical adherence on sociodemographic variables, social support dimensions, and *SUMIC* Syndemic class. Main effects models were specified utilizing these correlates, and a backwards deletion approach reduced the models. In order to test Hypothesis 3.1, interaction terms were included to assess the following potential effect modifications on the relationship between syndemic class and HIV medical adherence:

1.) Sex **X** *SUMIC* Syndemic class
2.) Health-related support **X** *SUMIC* Syndemic class
3.) ART-related support **X** *SUMIC* Syndemic class
4.) Negative social exchange **X** *SUMIC* Syndemic class
5.) Reciprocal support **X** *SUMIC* Syndemic class
6.) Main supporter type **X** *SUMIC* Syndemic class

Other theoretically relevant interactions were also assessed between correlates of interest and their impact on HIV medical adherence (Chapter Six). Finally, goodness of fit and internal consistency measures were used to compare all models. Cronbach's alpha was calculated for all scales, as a reliability estimate (Osburn, 2000; Tan, 2009; Croasmon & Ostrom, 2011). However, while it may underestimate reliability among Likert scale items (Gadermann, Gruhm, & Zimbo, 2012; Osburn, 2000), Cronbach's

alpha is appropriate to use as long as unidimensionality is maintained as was the case with the measures used in the present analyses (Schmitt, 1996).

Moreover, it is a widely recognizable measure and, as stated by Peterson and Kim (2013), the impact of the underestimation is negligible in practical applications. Also, Cronbach's alpha was used as computationally equivalent to the KR-20 for handling binary data (Tan, 2009). Next, use of single-item variables was minimized where possible, in order to improve reliability of measures used in statistical analyses (Gliem & Gliem, 2003; Blalock, 1970).

Additionally, Root mean square error approximation (RMSEA), Comparative Fit Indices (CFI), and Chi-square tests (χ^2) were used to compare measurement models for *SUMIC* Syndemic factors (Rasch, 1980). Latent class analyses models were compared using Akaike's Information Criteria (AIC), Bayesian Information Criteria (BIC), Entropy, and Likelihood-ratio test chi-square statistics (Akaike, 1973). AIC and BIC did not determine Poisson regression model acceptability due to theoretical significance for included variables, some of which were not statistically significant.

QUALITY CONTROL AND OTHER CONSIDERATIONS

Quality assurance

Much of the necessary quality assurance of the parent study ensures reduced methodological issues within the proposed study. Firstly, all assessments completed by study participants were the result of pilot testing and previous research by the PI in similar populations. Moreover, all research assistants and interviewers employed by the Lighthouse research facility have extensive experience and training in recruitment, data collection, and intervention work with the target population. Additionally, retention of

study participants remained at over ninety percent for follow-up assessments due to the expertise of Lighthouse staff at updating all contact records and maintaining correspondence with participants.

All interviews, conducted for screening as well as data collection purposes, were conducted appropriately for the sensitive nature of the subject matter (e.g. self-administered and/or confidential individual interviews with experienced interviewers). Reliability estimates were calculated for all quantitative scales completed by study participants. The internal consistency of the scales used for these analyses were determined via calculation of Cronbach's alpha coefficients for all included continuous measures, and factor analyses as appropriate. The proposed study conducted secondary data analyses of baseline data provided by Indexes.

Protection of human subjects

All proposed study protocol were conducted in accordance with the guidelines set forth by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB), as identified by the parent study procedures. Utmost diligence was exercised in protecting the rights and confidentiality of study participants. Recruitment was conducted via street outreach, and interested individuals contacted the Lighthouse and the study was described to them. Eligibility screening was conducted via telephone or face-to-face interview, and eligible persons were invited to participate. Research staff contacted participants directly, unless authorized to leave messages with others.

Participants were contacted via the method and address they provided, for the purposes of appointment reminders and re-screening to verify eligibility at baseline (Time 1) assessment. All information was retained in an encrypted Client Tracking

Database, and all paper forms were kept in locked file cabinets. No contact information was collected for individuals who were not deemed eligible to enroll in the parent study. Names were kept confidential via use of ID codes to identify participants, which were only assigned to actual data for the purposes of data analysis and coding. All research facility staff involved in the parent study were also HIPAA certified to uphold all privacy laws set forth by the by the Institutional Review Board at the Johns Hopkins Bloomberg School of Public Health, from whom the parent study obtained approval.

REFERENCES

Ahn, J., McCombs, J.S., Jung, C., Croudace, T.J., McDonnell, D., Ascher-Svanum, H., Edgell, E.T., Shi, L. (2008). Classifying patients by antipsychotic adherence patterns using latent class analysis: characteristics of nonadherent groups in the California Medicaid (Medi-Cal) program. *Value in Health, 11*(1), 48-56.

Akaike, H. (1973). Information theory and an extension of the maximum likelihood principle. In Second International Symposium on Information Theory. Budapest, Hungary.

Collins, L.M., Lanza, S.T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences.* New York, NY: Wiley Publishing.

Bakken, S., Holzemer, W.L., Brown, M.A., Powell-Cope, G.M., Turner, J.G., Inouye, J., Nokes, K.M., Corless, I.B. (2000). Relationships between perception of engagement with health care provider and demographic characteristics, health status, and adherence to therapeutic regimen in persons with HIV/AIDS. *AIDS Patient Care & STDS*, 14, 189-97.

Barrera Jr., M.A. Gottlieb, B.H. (1981). *Social Support in the adjustment of pregnant adolescents: Assessment issues*. In B.H. Gottlieb (Eds.) Social networks and social support (69-96). Sage Publications: Beverly Hills, CA.

Bastard, M., Koita, F.M., Laniece, I., Taverne, B., Desclaux, A., Ecochard, R., Sow, P.S., Delaporte, E., Etard, J.F. (2011). Revisiting long-term adherence to HAART in Senegal using latent class analysis. *Journal of Acquired Immune Deficiency Syndrome, 57*(1), 55-61.

Batchelder, A.W., Gonzalez, J.S., Berg, K.M. (2014). Differential medication nonadherence and illness beliefs in co-morbid HIV and type 2 diabetes. *Journal of Behavioral Medicine, 37*(2), 266-75.

Blalock, H.M., Jr. (1970). Estimating measurement error using multiple indicators and several points in time. *American Sociological Review, 35*(1), 101-11.

Burgess, A., Dayer, M., Catalan, J., Hawkins, D., Gazzard, B. (1993). The reliability and validity of two HIV-specific health-related Quality-of-Life measures: a preliminary analysis. *AIDS, 7*(7), 1001-8.

Chesney, M.A. (2006). The elusive gold standard. Future perspectives for HIV adherence assessment and intervention. *Journal of Acquired Immune Deficiency Syndrome, 43*(S1), S149-55.

Cotton, S., Puchalski, C.M., Sherman, S.N., Mrus, J.M., Peterman, A.H., Feinberg, J.,

Pargament, K.I., Justice, A.C., Leonard, A.C., Tsevat, J. (2006). Spirituality and religion in patients with HIV/AIDS. *Journal of General Internal Medicine*, 21:5e13.

Croasmun, J.T., Ostrom, L. (2011). Using Likert-Type Scales in the Social Sciences. *Journal of Adult Education, 40*(1): 19-22.

DiMatteo, M.R., Giordani, P.J., Lepper, H.S., Croghan, T.W. (2002). Patient adherence and medical treatment outcomes: a meta-analysis. *Medical Care, 40*(9), 794-811.

Fairley, C.K., Permana, A., Read, T.R. (2005). Long-term utility of measuring adherence by self-report compared with pharmacy record in a routine clinic setting. *HIV Medicine,* 6, 366-9.

Fremont, A., Young, A., Chinman, M., Pantoja, P., Morton, S.C., Koegel, P., Sullivan, J.G., Kanouse, D.E. (2007). Differences in HIV Care between Patients with and Without Severe Mental Illness. *Psychiatric Services, 58*(5), 681-8.

Fong, Y. (2014). R Statistical Software – Chngpt package for change point logistic regression. *Retrieved September 7, 2014 from* http://www.cran.rproject.org/web/packages/chngpt/chngpt.pdf.

Gadermann, A.M, Guhn, M., Zumbo, B.D. (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: A conceptual, empirical, and practical guide. *Practical Assessment, Research & Evaluation, 17*(3), 1-13.

Gliem, J.A., Gliem, R.R. (2003). Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-Type Scales. *Retrieved September 7, 2014 from* http://pioneer.netserv.chula.ac.th/~ppongsa/2013605/Cronbach.pdf

Gordon, R.A. (2012). *Applied Statistics for the Social and Health Sciences*. New York, NY: Routledge.

Howard, A.A., Arnsten, J.H., Lo, Y., Vlahov, D., Rich, J.D., Schuman, P., Stone, V.E., Smith, D.K., Schoenbaum, E.E., HER Study Group. (2002). A prospective study of adherence and viral load in a large multi-center cohort of HIV-infected women. *AIDS, 16*(16), 2175-82.

Israelski, D., Gore-Felton, C., Power, R., Wood, M.J., Koopman, C. (2001). Socio-demographic characteristics associated with medical appointment adherence among HIV-seropositive patients seeking treatment in a county outpatient facility. *Preventive Medicine, 33*(5), 470-5.

Knowlton, A.R., Latkin, C.A. (2007). Network financial support and conflict as predictors of depressive symptoms among a highly disadvantaged population. *Journal of Community Psychology, 35*(1), 13-28.

Latkin, C.A., Mandell, W., Vlahov, D. (1996). The relationship between risk networks' patterns of crack cocaine and alcohol consumption and HIV-related sexual behaviors among adult injection drug users: a prospective study. *Drug & Alcohol Dependence, 42*(3), 175-81.

Long, J.S. (1997). *Regression Models for Categorical and Limited Dependent Variables – Advanced Quantitative Techniques in the Social Sciences.* (1st ed). Thousand Oaks, CA: Sage Publications.

MacCallum, R.C., Zhang, S., Preacher, K.J., Rucker, D.D. (2002). On the Practice of Dichotomization of Quantitative Variables. *Psychological Methods, 7*(1), 19-40.

Mannheimer, S., Friedland, G., Matts, J., Child, C., Chesney, M. (2002). The consistency of adherence to antiretroviral therapy predicts biologic outcomes for human immunodeficiency virus-infected persons in clinical trials. *Clinical & Infectious Diseases, 34*(8), 1115-21.

McDowell, I., Newell, C. (1996). *Measuring Health.* (2nd ed). New York, NY: Oxford.

McNutt, L., Wu, C., Xue, X., Hafner, J.P. (2003). Estimating the relative risk in cohort studies and clinical trials of common outcomes. *American Journal of Epidemiology*, 157, 940-3

Mills, E.J., Nachega, J.B., Buchan, I., Orbinski, J., Attaran, A., Singh, S., Rachlis, B., Wu, P., Cooper, C., Thabane, L., Wilson, K., Guyatt, G.H., Bangsberg, D.R. (2006). Adherence to antiretroviral therapy in sub-Saharan Africa and North America: A meta-analysis. *JAMA*, 6, 679-90.

Newsom, J.T., Nishishiba, M., Morgan, D.L., Rook, K.S. (2003). The relative importance of three domains of positive and negative social exchanges: A longitudinal model with comparable measures. *Psychology & Aging*, 18,746-54.

Nova Research Company (2006). Questionnaire Development System [computer software]. Bethesda, MD: Nova Research Company.

Osburn, H.G. (2000). Coefficient alpha and related internal consistency reliability coefficients. *Psychological Methods*, 5, 343-55.

Paterson, D.L., Swindells, S., Mohr, J., Brester, M., Vergis, E.N., Squier, C., Wagener, M.M., Singh, N. (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Annals of Internal Medicine, 133*(1), 21-30.

Pearlin, L.I., Mullan, J.T., Aneshensel, C.S., Wardlaw, L.A. (1994). The structure and functions of AIDS caregiving relationships. *Psychosocial Rehabilitation Journal, 17,* 51-67.

Peterson, R.A., Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *Journal of Applied Psychology, 98*(1), 194-8.

Rasch, G. (1980). *Probabilistic models for Some Intelligence and Attainment tests.* Chicago, IL: University of Chicago Press.

Schmitt, N. (1996). Uses and Abuses of Coefficient Alpha. *Psychological Assessment, 8*(4), 350-3.

Schneider, J., Kaplan, S.H., Greenfield, S., Li, W., Wilson, I.B. (2004). Better physician-patient relationships are associated with higher reported adherence to antiretroviral therapy in patients with HIV infection. *Journal of General Internal Medicine,* 19, 1096-1103.

Schumacher, W.E., Frick, M., Kauselmann, V., Maier-Hoyle, R., van der Vliet, R., Babiel, R. (2007). Fully automated quantification of human immunodeficiency virus (HIV) type 1 RNA in human plasma by the COBAS AmpliPrep/COBAS Taqman system. *Journal of Clinical Virology*, 38, 304-12.

Semple, S.J., Strathdee, S.A., Zians, J., Patterson, T.L. (2009). Family conflict and depression in HIV-negative heterosexuals: The role of methamphetamine use. *Psychology of Addictive Behavior, 23*(2), 341-7.

Shapiro, M.F., Morton, S.C., McCaffrey, D.F., Senterfitt, J.W., Fleishman, J.A., Perlman, J.F., Athey, L.A., Keesey, J.W., Goldman, D.P., Berry, S.H., Bozzette, S.A. (1999). Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. *JAMA*, *281*(24), 2305-15.

Straus, M.A. (1979). Measuring intra family conflict and violence: The Conflict Tactics (CT) Scales. *Journal of Marriage & the Family, 41*(1), 75-88.

Steel, G., Nwokike, J., Joshi, M.P. (2007). *Development of a Multi-Method Tool to Measure ART Adherence in Resource-Constrained Settings: The South Africa Experience.* Submitted to the U.S. Agency for International Development by the Rational Pharmaceutical Management Plus Program. Management Sciences for Health: Arlington, VA.

Tan, S. (2009). Misuses of KR-20 and Cronbach's Alpha Reliability Coefficients. *Education & Science, 34*(152), 101-12.

Wight, R.G., Aneshensel, C.S., Murphy, D.A., Miller-Martinez, D., Beals, K.P. (2006). Perceived HIV stigma in AIDS caregiving dyads. *Social Science & Medicine, 62*(2), 444-56.

CHAPTER FOUR: MANUSCRIPT ONE

Sex differences, behavioral factors, and HIV viral suppression among African-American injection drug users

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ABSTRACT

Introduction: Research suggests sex differences exist in achieving undetectable viral load (UVL) among persons living with HIV (PLHIV). Extant research also suggests that social support is protective of UVL among PLHIV, and may vary by factors such as physical functioning and sex. Therefore, the purpose of this study was to identify correlates of UVL among African-American PLHIV. **Method:** Data were from the BEACON study of injection drug-using PLHIV on ART. Poisson regression with robust standard errors was implemented. **Results:** Males with moderate physical functioning had 1.4 times the likelihood of UVL as males who reported low physical functioning (Adjusted Incidence Rate Ratio [AIR] = 1.38; 95% Confidence Interval [95% CI] = 1.07, 1.77; *N*=199). Females who were actively using 1-2 substances had a 30% lower probability of UVL, as compared to females were not actively using substances (AIR = 0.73; 95% CI = 0.52, 1.03). **Discussion:** Findings suggests that social support, active substance use, and mental illness function differently among males and females in their association with UVL. Therefore, healthcare professionals should develop sex-specific interventions to improve PLHIVs' health outcomes.

Key words: HIV viral suppression, injection drug use, gender, health disparities, African-Americans

INTRODUCTION

At the end of 2009, an estimated 1.1 million Americans aged thirteen and over were persons living with HIV (PLHIV) in the United States (Centers for Disease Control and Prevention [CDC], 2012). Among these individuals, eighteen percent were undiagnosed, and unaware of their HIV status (CDC, 2012). In 2010, there were approximately fifty thousand new HIV infections, nearly half of which were among African-Americans (CDC, 2012). In addition to race differences in HIV infection, gender differences exist in HIV-related outcomes. Compared to men, women are more likely to delay getting tested for HIV, lack access to regular medical care, and are more likely to convert from HIV to AIDS within a year of diagnosis (CDC, 2008; CDC, 2012).

Due to race and gender disparities, African-American women are estimated to have an HIV incidence approximately eight times that of White-American women (CDC, 2012; Prejean et al., 2011). In addition to higher incidence and prevalence of HIV, African-American women also have lower rates of achieving viral suppression than other groups, since the advent of highly active antiretroviral therapy (ART) in the U.S. (CDC, 2012; Holtgrave, Hall, Rhodes, & Wolitski, 2009; Kaiser Daily Health Reports, 2006). More research is needed to illuminate the factors which place African-Americans, and more specifically African-American women at increased risk of negative HIV-related health outcomes.

Race and gender disparities in HIV outcomes

Comprehensive consideration of HIV-related disparities illuminates macro-level (e.g. race and gender), mezzo-level (e.g. interpersonal relationships), and micro-level risk factors (e.g. individual health behaviors; Berkman, Glass, Brissette, & Seeman, 2000). At

the macro level, African-Americans are often subjected to institutional racism, which predicts differential access to good and services on the basis of race (Jones, 2000). Institutional racism has predicated less medical care access among African-American PLHIV. Moreover, due to cultural and communication barriers between patients and providers, even when care is accessed, African-American PLHIV receive inferior care compared to other races (Randall & Randall, 1993; Jones, 2000; Hall, An, Hutchinson, & Sansom, 2008; CDC, 2012). These disparities are seen in conditions distinct from, yet co-morbid with HIV, including mental illness, cancer, cardiovascular disease, and chronic pain (Randall & Randall, 1993;Agency for Healthcare Research and Quality [AHRQ], 2012; CDC, 2012).

Both African-American race, and female sex, correlate with higher risk of HIV-related burden (AHRQ, 2012; CDC, 2012; Prejean et al., 2011). Thus, African-American women represent the PLHIV most at risk for non-adherence to ART, detectable viral load, and faster progression to AIDS (Turner, Laine, Cosler, & Hauck, 2003; Wyatt, 2002; CDC, 2012; Prejean et al., 2011; AHRQ, 2012). Reasons for these disparities include more experiences of HIV stigma, lower perceived social support, and competing (caregiving) priorities that interfere with medical adherence, such as having an HIV-positive significant other for whom they provide care (Edwards, 2006; Knowlton et al., 2011; Office of Women's Health, 2012). More research is needed to disentangle the multi-level complexities between race, gender, and other correlates of HIV-related outcomes.

Barriers to viral suppression among PLHIV: co-morbidities

Compared to the general population, PLHIV experience higher rates of several co-morbidities which impede viral suppression (Undetectable viral load [UVL]; Kaaya et

al., 2013). First, depression is at least twice as prevalent among PLHIV, as compared to non-infected individuals (Maj, Janssen, Starace, Zaudig, & Satz, 1994; Kaaya et al., 2013; Owe-Larsson, Sall, Salamon, & Allgulander, 2009). Compared to men, adult women are more likely to be diagnosed with serious mental illnesses, which include major depression, bipolar disorder, post-traumatic stress disorder (PTSD), and schizophrenia (SAMHSA, 2013; Novak, Colpe, Barker, & Gfroerer, 2010). Women are also less likely to achieve UVL than men, with larger disparities between men and women seen among African-Americans (Turner et al., 2003; CDC, 2012; Prejean et al., 2011).

Similarly, mental illness and substance use often co-occur. Hartz and colleagues (2014) found that those with severe mental illnesses were between three and five times more likely to engage in substance use. Among PLHIV, between 2004 and 2007, nearly sixty percent of persons who inject drugs (PWID) who were newly HIV-positive were African-American, and up to thirty percent of non-injection users are PLHIV (CDC, 2012). Adherence to ART is the single best predictor of achieving UVL; therefore UVL often serves as a proxy for measuring ART adherence (Chesney, 2006; Mannheimer, Friedland, Matts, Child, & Chesney, 2002; Howard et al., 2002; Paterson et al., 2000; DiMatteo, Giordani, Lepper, & Croghan, 2002). However, a further complication in achieving UVL is that medications used to treat mental illness and/or substance use may interact with ART regimens and reduce their effectiveness (Zea, Reisen, Poppen, Bianchi, & Echeverry, 2005; Li, Ji, Ding, Tian, & Lee, 2012).

Finally, substance use, mental illness, and HIV are all factors which may create tension in the PLHIV' social environment, resulting in familial conflict. Familial conflict

refers to disagreements between family members, often immediate family who are same household residents, which can be either acute or chronic (Dunbar, 1990; Chesney & Folkman, 1994; Feaster et al., 2010). Literature on familial conflict suggests that HIV diagnosis represents a chronic stressor, which may reinforce substance use and/or mental illness (Semple et al., 1997; Chesney & Folkman, 1994; Zea, et al., 2005; Li, et. al, 2012).

Facilitators of viral suppression among PLHIV: social support

Research suggests that social support is predictive of health behaviors (Glass, Perrin, Campbell, & Soeken, 2007; Marmot, 2006; Robertson, 2006; Knowlton et al., 2011; Edwards, 2006; Parsons et al., 2006; Strine, Chapman, Balluz, & Mokdad, 2008). Social support generally refers to perceived and/or enacted instrumental, informational, or emotional support (Eaton, Flisher, & Aarø, 2003; Carrieri et al., 2003; Burke & Dunbar-Jacob, 1995; Coker, Watkins, Smith, & Brandt, 2003). Within the context of HIV, social support is often informal care provided by family members or main partners, and includes vital transportation to medical visits and management of ART regimens (Knowlton & Latkin, 2007; Jones, 2000; Kalichman, Cherry, & Brown, 1999; Baker, Kochan, Dixon, Heather, & Wodak, 1994; Edwards, 2006). A previous study found informal care correlated with ART adherence among male PLHIV, but only if they reciprocated, or mutually exchanged, support to their caregivers (Knowlton et al., 2011).

Research suggests that social support, specifically health-related support and reciprocity, may facilitate PLHIV' achievement of UVL (Edwards, 2006; Tucker et al., 2003; Knowlton et al., 2011; Mosack, & Petroll, 2009). African-American PLHIV are more likely than other racial/ethnic groups to report informal care receipt (Pearlin,

Semple, & Turner, 1988; Chander, Himelhoch, & Moore, 2006; Knowlton et al., 2011). However, they are still more likely than other racial groups to have low ART adherence, and detectable viral loads. The same trend is seen with women PLHIV, such that they report higher levels of social support in general, yet more ART non-adherence, and viral non-suppression than men (Kalichman & Rompa, 2003; Vitiello et al., 2003). Therefore, differentiating types and amounts of social support and informal care is necessary to understanding their role in PLHIVs' ART adherence, and their facilitation of viral suppression (Wagner & Rabkin, 2000; Carrieri et al., 2003).

Purpose

In sum, African-American PLHIV are at highest risk for negative HIV outcomes such as detectable viral load. Moreover, evidence suggests risks and protective factors of UVL may differ between men and women PLHIV. The purpose of this study was to identify correlates of viral suppression among predominantly low-income, African-American injection drug-using PLHIV. Specifically, the study sought to: (a) identify correlates of viral suppression among these individuals; and (b) assess sex differences in the relationship between these correlates and UVL. Findings have implications for interventions to improve health outcomes among disadvantaged PLHIV.

METHODS

Procedure

Data were from baseline of the BEACON study, which examined social factors associated with health outcomes among disadvantaged PLHIV (*N*=383). Participants (Indexes) were former and/or current persons who inject drugs residing in Baltimore.

Inclusion criteria included being: (a) adult; (b) HIV-positive; (c) on antiretroviral therapy (ART); (d) a Baltimore City resident; (e) a current or former injection drug user; and (f) willing to invite one's main supportive tie(s) to participate in the study. Participants were recruited through an HIV clinic and street outreach. The study was approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

Measures

Dependent variable

Viral suppression was defined as ≤40 copies per mL, as measured by the Roche Cobas Amplicor (Schumacher et al., 2007). Viral load was dichotomized, where 0 = detectable viral load, and 1 = undetectable viral load (UVL).

Independent variables

Predictor variables included active substance use, mental illnesses diagnoses, familial conflict, patient-provider communication, and social support (e.g. main supporter relationship, religious activity, health-related support, and support reciprocity). Active substance use was coded as use of opiates, marijuana, heroin, cocaine or crack, hallucinogens, and/or prescription drug use in the past month, where 0 = no active substance use, 1 = 1 to 2 substances used, and 2 = 3 or more substances. Mental illness was coded as having ever been diagnosed by a doctor with major depression, bipolar disorder, anxiety or post-traumatic stress disorder (PTSD), schizophrenia, and/or any other psychiatric condition, where 0 = no mental illness diagnoses, 1 = 1 to 2 diagnoses, and 2 = 3 or more diagnoses.

Familial conflict was coded as family members rarely discussing problems,

problem-solving together, and/or show caring for one another, where 0 = low familial conflict, 1 = moderate familial conflict, and 2 = frequent familial conflict. Familial conflict questions were based on the Conflict Tactics Scale, which assesses constructs of intra-family aggression, violence, and conflict resolution (Straus, 1979). Patient-provider communication was assessed by a ten-item scale based on the Engagement with Healthcare Provider Scale (Bakken et al., 2000). These items included "My doctor involves me in decisions"; and "My doctor respects my choices." Responses were on 4-point Likert scale, ranging from "Never" to "Always". Responses were dichotomized at the median, where 0 = low patient/provider communication and1 = high patient-provider communication (MacCallum, Zhang, Preacher, & Rucker, 2002).

Main supporter relationship to Indexes was coded as 0 = other relationship/or no main supporter identified, 1 = main partner, and 2 = kin. Religious activity conceptualized as a dimension of organizational support, and was assessed by "How often do you go to religious services?" Responses were on a 6-point Likert scale, from "Never" to "More than once a week". Categories trichotomized at the tertiles, such that 0 = low attendance, 1 = moderate attendance, 2 = frequent attendance (Fong, 2014). Health-related support refers to support that Indexes have which assists them in engagement in health-related behaviors. Items were based on the Arizona Social Support Inventory (Barrera, Jr. & Gottlieb, 1981), and included "In the last year, has anyone gone with you to a doctor's appointment or to the ER to get medical care?" Responses were dichotomized at the median, where 0 = low health-related support, and 1 = high health-related support (MacCallum et al., 2002).

Support reciprocity was assessed with items based on the scale by Pearlin, Mullan,

Aneshensel, and Wardlaw (1994), which assessed activities that Indexes reported providing to their main supporters in the past 12 months. The items included "How much have you helped your main supporter around the house in the past year?"; and "How much have you expressed affection and appreciation for your main supporter in the past year?" Participants' responses were on a 3-point Likert scale, ranging from "None" to "A lot". Responses were trichotomized at the tertiles, where 0 = low reciprocity, 1 = medium reciprocity, and 2 = high reciprocity (MacCullum et al., 2002).

Physical functioning and educational attainment were included as sociodemographic control variables. Physical functioning was assessed by a ten-item scale based on the Medical Outcomes Study Physical Functioning Measure (McDowell & Newell, 1996). These items included "How much does your health affect your ability to bend, lift, or squat down?"; and "How much does your health affect your ability to eat, dress, or bathe?" Responses were trichotomized at the tertiles, where 0 = low physical functioning, 1 = moderate physical functioning, and 2 = high physical functioning (Fong, 2014). Educational attainment was assessed by a single item, "What is the highest level of education you've had?" Responses were collapsed into categories, where 0 = 8th grade or less, 1 = some high school, 2 = high school diploma or GED, 3 = some college or above. All analyses were conducted separately by sex due to evidentiary support which suggests that correlates of interest may function differently by gender (CDC, 2012; AHRQ, 2012). Sex was assessed by a single item, and coded 1 = males, and 2 = females.

Data analyses

Univariate frequencies were generated for the dependent and independent

variables, on the total sample (N=383) and also separately by sex (male/female). Next, unadjusted incidence rate ratios were calculated. Variables marginally significant at the bivariate level (p<.10; Gordon, 2012), in at least one group, were entered into a multivariate Poisson regression, to regress UVL on correlates separately by sex. Poisson regression is appropriate for binary outcomes for non-rare events. Robust standard errors accounted for heteroskedasticity (inconstant variation; Long, 1997). The same model was run on both groups. Regression analyses were only run with African-American participants, due to lack of statistical variation in race, and theoretical significance. Educational attainment and physical functioning were retained as control variables in the final model, despite non-significance. Finally, post-hoc analyses were conducted to test for potential interactions between control variables and social support variables, and substance use, mental illness, and/or familial conflict. Analyses were conducted on complete cases only, due to acceptable missingness (up to 10%; Bennett, 2001). All analyses were conducted in STATA Version 11.2 SE (StataCorp, 2009).

RESULTS

Descriptive statistics

Table 4.1 reports demographic characteristics of all study participants (N=383). Participants were predominantly male (61.4%), African-American (91.6%), with a monthly income of $500-$999 (57.2%). The vast majority of participants also had a usual healthcare provider at a hospital-based outpatient HIV clinic (70.5%), were heterosexual (85.4%), and had a lifetime history of incarceration (84.1%). Regarding sex differences, females were less likely than males to have at least a high school education (32.4% vs. 41.3% respectively; p<.10). Females were also less likely than males to report good

health in the past 6 months (29.1% vs. 40%, respectively; $p<.05$), and to have an undetectable viral load (66.4% versus 64.9%, respectively; non-significant). Females were also younger than males on average (45.6 years vs. 49.6 years, respectively; $p<.001$).

Poisson regression results: African-American males

In adjusted analyses, males with 1 to 2 mental illness diagnoses had 1.3 times the likelihood of UVL as males with no mental illness diagnoses (Adjusted Incidence Rate Ratio [AIR] = 1.28; 95% Confidence Interval [95% CI] = 1.00, 1.63). Similarly, males with high rates of familial conflict had 1.4 times the likelihood of UVL, as males with no familial conflict (AIR = 1.48; 0.98, 1.91). Next, males who had attended or completed college each had 1.9 times the likelihood of UVL, as compared to males who completed 8th grade or less (AIR = 1.89; 95% CI = 0.94, 3.79).

Results also indicated that males who reported moderate or high physical functioning had 1.4 times the probability of UVL, as compared to males with low physical functioning (95% CI = 1.07, 1.77). Males who reported moderate religious activity had 1.3 times the likelihood of UVL as males who reported low religious activity (AIR = 1.26; 95% CI = 0.98, 1.62). Finally, males who reported having a main partner or kin as their main supporter had 1.3 to 1.4 times the likelihood of UVL, as males who reported some other or no main supporter ($p<.05$ and $p<.10$, respectively).

Poisson regression results: African-American females

In the adjusted analyses, results indicated that females who were actively using 1-2 substances had a 30% lower probability of UVL, as compared to females were not actively using substances (Table 4.2; Adjusted Incidence Rate Ratio [AIR] = 0.73; 95% Confidence Interval [95% CI] = 0.52, 1.03). Results also indicated that females with 1-2

mental illness diagnoses had a 40% higher probability of UVL, as compared to females with no mental illness diagnoses (AOR = 1.39; 95% CI = 0.99, 1.94). Though marginally significant, females with moderate familial conflict had 50% higher probability of UVL as females with no familial conflict (AIR = 1.37; 95% CI = 1.08, 2.04). Next, females who attended religious activities moderately or frequently had 1.4 to 1.5 times the likelihood of UVL as females who rarely attended religious activities ($p<.10$ and $p<.05$, respectively). Females who had either a kin or partner main supporter had 1.5 to 1.6 times the likelihood of UVL, compared to females with another main supporter ($p<.05$).

Females who reciprocated support often to their main supporters had one-third the likelihood of UVL as compared to females who rarely reciprocated support (AIR = 0.69; 95% CI = 0.47, 1.01). This is in contrast to previous literature, which suggests that higher reciprocity would be associated with higher likelihood of UVL (Knowlton et al., 2011). Finally, females who reported high doctor-patient communication had nearly 1.3 times the probability of UVL, as females who reported low doctor-patient communication (AIR = 1.35; 95% CI = 1.06, 1.72).

Post-hoc analyses

Marginal effects of the predicted probability of UVL were calculated holding the other covariates at their means to assess the relationship between social support and viral suppression among African-American Indexes (StataCorp, 2009). Figure 4.1 depicts the marginal effects UVL by sex, as a function of all four social support variables, (e.g. main supporter relationship, religious activity, health-related support and support reciprocity; N=321). Compared to females, males had higher probability of UVL when engaging in moderate religious activity (0.75 vs. 0.65, respectively; non-significant), as well as

frequent religious activity (0.59 vs. 0.47, respectively; non-significant). For both males and females, probability of UVL was higher when main supporters were main partners. Finally, neither frequent health-related support nor frequent support reciprocity were protective, as both correlated with lower probability of UVL for males and females.

DISCUSSION

It is evident from study results that there were significant gender differences in the effects of substance use, mental illness, and social support on viral suppression. This is intuitive, considering the plethora of research which suggests that men and women differ in their access of HIV health services, risk for HIV infection. Findings suggest that sex differences may also exist in utilization of informal caregivers and social support networks to engage in health behaviors among PLHIV. Our results revealed that in this PLHIV population, contrary to expectation, social support was often associated with lower likelihood of viral suppression (Table 4.2). Specific mechanisms which explain this, however, may differ by gender (Figure 4.1).

First, findings indicated reciprocating support was negatively associated with UVL for females, such that high reciprocity was associated with only one-third the likelihood of undetectable viral load, as compared to females reporting low reciprocity to caregivers. It is plausible that female care recipients were more likely to give support rather than receive support in their relationships, and therefore reciprocated support to their main partners, which is thereby detrimental to their ART outcomes. Similarly, higher rates of health-related support predicted lower likelihood of UVL among females. One reason for this may be that accessing health-related support is non-normative for women, as they are more likely than men to report providing informal care, rather than receiving it (Squires et al., 2011).

Recent findings by Drabe et al. (2014) suggest that female patients' depression and quality of life were much more strongly associated with their male partners' resources, as compared to males, for whom there was a very low association of depression and quality of life with their female partners. While not statistically significant, African-American female Indexes were more likely than African-American male Indexes to report that their main supporter was their main partner (36% vs. 28%, respectively; $p<.05$), and also less likely to achieve viral suppression than males (67.1% vs. 65.9%, non-significant). It is possible that communication is complicated when male main partners provide care, and that communication may be more important to female PLHIV. Communication in the healthcare setting also appears more important to females than males as high patient-provider communication was associated with a 35% increase in likelihood of UVL among females. Similar findings on this association were also found by Bakken et al. (2000) and Schneider, Kaplan, Greenfield, Li, and Wilson (2004).

Finally, a few similarities can be identified between males and females' correlates of viral suppression. First, physical health and mental health are quality of life measures which are often included in analyses of HIV-related outcomes. In the present study, these factors were statistically significant correlates of increased likelihood of viral suppression among males (physical health and mental illness), and females (mental illness). Among males, physical functioning was predictive of viral suppression among males, as males who reported moderate to high physical function had 1.3 times the likelihood of UVL, as males who reported low physical functioning. Also, for both sexes, it was protective to have main supporters who were either main supporters or kin. Therefore, while the communication barriers are great, healthcare providers should include these individuals

in treatment recommendations for PLHIV. Finally, religious activity was protective for both males and females, which supports previous findings which suggest that religiosity is a common coping mechanism among PLHIV (Ironson, Stuetzle, & Fletcher, 2006).

Post-hoc analyses revealed that two-thirds of males achieved viral suppression (67.1%). Among these virally-suppressed males, nearly one-third reported low physical functioning (27.9%). Therefore, future research should consider health-related physical functioning and quality of life, and UVL outcomes, such that interventions with men and women PLHIV should account for improving relevant dimensions of health-related quality of life. Next, religious activity was associated with viral suppression for both sexes, while the following were associated with lower viral suppression: higher health-related support, and reciprocal support (still, not all results were statistically significant).

Limitations

Several limitations exist in consideration of study findings. First, viral suppression as a measure of ART adherence relies solely on biomarker data, without consideration of relevant factors such as pain symptomology, adverse reactions to ART, or quality of life. Second, the data were cross-sectional, which prevents the ascertainment of fluctuations over time in the variables of interest. Third, other correlates may have fit the data better, such as adherence to medications to treat disorders such as mental illnesses, which were common in this study population. Fourth, running analyses separately by sex among may have led to a loss of statistical power to detect significant findings. Fifth, gender and sex were considered equivalent both theoretically and analytically, which may be simplistic given that sex is biological while gender is sociocultural and more subjective. Finally, participants were predominantly African-American, middle-aged, persons who inject

drugs, enrolled in medical care and on ART. Thus, while this population is often underrepresented in research, these characteristics limit the generalizability of findings.

Conclusions

Despite these limitations, results support the need for further exploration of social factors in the health outcomes of PLHIV. Specifically among the African-American participants, attention should be paid their close relationships outside of the care recipient-caregiver dyad, in terms of explaining greater variations in the role of health-related support in viral suppression and other HIV outcomes. Social support and informal caregiving ties have been theorized to affect care recipients' chronic illness outcomes, and ultimately, achievement of viral suppression (Strine, Chapman, Balluz, & Mokdad, 2008). This study is one of few which examined sex differences in several dimensions of enacted social support concurrently, including support reciprocity and the nature of the relationship between main supporters and care recipients (Knowlton et al., 2011). Therefore, interventions to improve ART outcomes among PLHIV should address substance use and mental illness, and stressors such as familial conflict.

Another important contribution of this study was the examination of purported facilitators of viral suppression (e.g. social support), and barriers (e.g. substance use). Future studies should also examine these factors to make treatment recommendations. Results suggest the following impact viral suppression, among males and females: 1) physical and/or mental health; 2) active substance use; and 3) dynamics of the caregiver-care recipient dyad. This lends support for programs to improve caregiver that focus on both individual and dyad-level factors. Comprehensive interventions could directly benefit PLHIV' health, indirectly improve caregivers' health, and reduce care cessation.

REFERENCES

Agency for Healthcare Research and Quality [AHRQ]. (2012). Disparities in Health Care Quality among Minority Women. *Retrieved August 1, 2014 from* http://www. ahrq.gov qual/nhqrdr11/nhqrminoritywomen11.htm.

Baker, A., Kochan, J., Dixon, J., Heather, N., Wodak, A. (1994). Controlled evaluation of a brief intervention for HIV prevention among injection drug users not in treatment. *AIDS Care, 6*(5), 559-70.

Bakken, S., Holzemer, W.L., Brown, M.A., Powell-Cope, G.M., Turner, J.G., Inouye, J., Nokes, K.M., Corless, I.B. (2000). Relationships between perception of engagement with health care provider and demographic characteristics, health status, and adherence to therapeutic regimen in persons with HIV/AIDS. *AIDS Patient Care & STDS*, 14, 189-97.

Barrera Jr., M.A. Gottlieb, B.H. (1981). *Social Support in the adjustment of pregnant adolescents: Assessment issues*. In B.H. Gottlieb (Eds.) Social networks and social support (69-96). Sage Publications: Beverly Hills, CA.

Bennett, D.A. (2001). How can I deal with missing data in my study? *Australian and New Zealand Journal of Public Health*, 25, 464-9.

Berkman, L.F., Glass, T., Brissette, I., Seeman, T.E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine*, 51, 843-57.

Burke, L.E., Dunbar-Jacob, J. (1995). Adherence to medication, diet, and activity recommendations: from assessment to maintenance. *The Journal of Cardiovascular Nursing,* 9, 62-79.

Carrieri, F.R., Lewden, C., Sobel, A., Michelet, C., Cailleton, V., Chêne, G., Leport, C., Moatti, J.P., Spire, B., APROCO study group. (2003). Impact of early versus late adherence to highly active antiretroviral therapy on immuno-virological response: a 3-year follow-up study. *Antiviral Therapy*, 8, 585-94.

Centers for Disease Control and Prevention [CDC]. (2008). HIV=AIDS Surveillance Report, 2006. *Retrieved August 26, 2014 from* http://www.cdc.gov.

CDC. (2012). Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 U.S. dependent areas—2010. *HIV Surveillance Supplemental Report, 17*(3A), 1-20.

Chander, G., Himelhoch, S. Moore, R.D. (2006). Substance Abuse and Psychiatric Disorders in HIV-Positive Patients: Epidemiology and Impact on Antiretroviral Therapy. *Drugs, 66*(6), 769-89.

Chesney, M.A. (2006). The elusive gold standard. Future perspectives for HIV adherence

assessment and intervention. *Journal of Acquired Immune Deficiency Syndrome, 43*(S1), S149-55.

Chesney, M.A., Folkman, S. (1994). Psychological impact of HIV disease and implications for intervention. *Psychiatric Clinics of North America,* 17, 163-182.

Coker, A.L., Watkins, K.W., Smith, P.H., Brandt, H.M. (2003). Social support reduces the impact of partner violence on health: Application of structural equation models. *Preventive Medicine, 37*(3), 259-67.

DiMatteo, M.R., Giordani, P.J., Lepper, H.S., Croghan, T.W. (2002). Patient adherence and medical treatment outcomes: a meta-analysis. *Medical Care, 40*(9), 794-811.

Drabe, N., Klaghofer, R., Weidt, S., Zwahlen, D., Büchi, S., Jenewein, J. (2014). Mutual associations between patients' and partners' depression and quality of life with respect to relationship quality, physical complaints, and sense of coherence in couples coping with cancer. *Psychooncology*, (Epub), doi: 10.1002/pon.3662.

Dunbar, J. (1990). Predictors of patient adherence: Patient characteristics. In S. A. Shumaker, E.B. Schron, & J.K. Ockene (Eds.). *The handbook of health behavior change* (348-360). Springer Publishing: New York, NY.

Eaton, L., Flisher, A.J., Aarø, L.E. (2003). Unsafe sexual behavior in South African youth. *Social Science & Medicine*, *56*, 149-65.

Edwards, L.V. (2006). Perceived Social Support and HIV/AIDS Medication Adherence among African-American Women. *Qualitative Health Research*, 16, 679-91.

Feaster, D.J., Brincks, A.M., Mitrani, V.B., Prado, G., Schwartz, S.J., Szapocznik, J. (2010). The Efficacy of Structural Ecosystems Therapy for HIV Medication Adherence with African-American Women. *Journal of Family Psychology, 24*(1), 51-9.

Fong, Y. (2014). R Statistical Software – Chngpt package for change point logistic regression. *Retrieved September 7, 2014 from* http://www.cran.rproject.org/ web/packages/chngpt/chngpt.pdf.

Glass, N., Perrin, N., Campbell, J.C., Soeken, K. (2007). The protective role of tangible support on post-traumatic stress disorder symptoms in urban women survivors of violence. *Research in Nursing &Health, 30*(5), 558-68.

Gordon, R.A. (2012). *Applied Statistics for the Social and Health Sciences.* New York, NY: Routledge.

Hall, I., An, Q., Hutchinson, A., Sansom, S. (2008). Estimating the Lifetime Risk of a Diagnosis of the HIV Infection in 33 States, 2004–2005. *JAIDS, 49*(3), 294-7.

Hartz, S.M., Pato, C.N., Medeiros, H., Cavazos-Rehg, P., Sobell, J.L., Knowles, J.A., Bierut, L.J., Pato, M.T. (2014). Comorbidity of Severe Psychotic Disorders With Measures of Substance Use. *JAMA Psychiatry, 71*(3), 248-54.

Holtgrave, D.R., Hall, H.I., Rhodes, P.H., Wolitski, R. (2009). Updated annual HIV transmission rates in the United States, 1977-2006. *Journal of Acquired Immune Deficiency Syndrome, 50*(2), 236-8.

Howard, A.A., Arnsten, J.H., Lo, Y., Vlahov, D., Rich, J.D., Schuman, P., Stone, V.E., Smith, D.K., Schoenbaum, E.E., HER Study Group. (2002). A prospective study of adherence and viral load in a large multi-center cohort of HIV-infected women. *AIDS, 16*(16), 2175-82.

Ironson, G., Stuetzle, R., Fletcher, M. A. (2006). An increase in religiousness /spirituality occurs after HIV diagnosis and predicts slower disease progression over 4 years in people with HIV. *Journal of General Internal Medicine*, 21, S62–8.

Jones, C.P. (2000). Levels of Racism: A Theoretic Framework and a Gardener's Tale. *American Journal of Public Health*, 90, 1212-16.

Kaaya, S., Eustache, E., Lapidos-Salaiz, I., Musisi, S., Psaros, C., Wissow. L., (2013). Grand Challenges: Improving HIV Treatment Outcomes by Integrating Interventions for Co-Morbid Mental Illness. *PLOS Medicine, (10*)5, e1001447.

Kaiser Daily Health Reports (2006). President Bush's FY 2007 budget proposal would reduce funding for CDC programs. *Retrieved August 27, 2014*, *from* http://www. kaisernetwork.org/daily_reports/print_report.cfm?DR_ID=36165&dr_cat=3.

Kalichman, S.C., Cherry, C., Brown, F. (1999). Effectiveness of a video-based motivational skills-building HIV risk-reduction intervention for inner-city African American men. *Journal of Consulting and Clinical Psychology*, 67, 959-66.

Kalichman, S.C., Rompa, D., (2003). HIV treatment adherence and unprotected sex practices in people receiving antiretroviral therapy. *Sexually Transmitted Infections*, 79, 59-61.

Knowlton, A.R., Latkin, C.A. (2007). Network financial support and conflict as predictors of depressive symptoms among a highly disadvantaged population. *Journal of Community Psychology, 35*(1), 13-28.

Knowlton, A.R., Yang, C., Bohnert, A., Wissow, L., Chander, G., Arnsten, J.A. (2011). Informal care and reciprocity of support are associated with HAART adherence among men in Baltimore, MD, USA. *AIDS & Behavior, 15*(7), 1429-36.

Li, L., Ji, G., Ding, Y., Tian, J., Lee, A. (2012). Perceived burden in adherence of antiretroviral treatment in rural China. *AIDS Care, 24*(4), 502-8.

Long, J.S. (1997). *Regression Models for Categorical and Limited Dependent Variables – Advanced Quantitative Techniques in the Social Sciences.* (1st ed). Thousand Oaks, CA: Sage Publications.

MacCallum, R.C., Zhang, S., Preacher, K.J., Rucker, D.D. (2002). On the Practice of Dichotomization of Quantitative Variables. *Psychological Methods, 7*(1), 19-40.

Maj, M., Janssen, R., Starace, F., Zaudig, M., Satz, P., Sughondhabirom, B., Luabeya, M., Riedel, R., Ndetei, D., Calil, H.M., Bing, E.G., Louis, M., Sartorius, N. (1994) WHO neuropsychiatric AIDS study, cross-sectional Phase-I - Study design and psychiatric findings. *Archives of General Psychiatry, 51*(1), 39-49.

Mannheimer, S., Friedland, G., Matts, J., Child, C., Chesney, M. (2002). The consistency of adherence to antiretroviral therapy predicts biologic outcomes for human immunodeficiency virus-infected persons in clinical trials. *Clinical & Infectious Diseases, 34*(8), 1115-21.

Marmot, M.G. (2006). Status syndrome: a challenge to medicine. *JAMA,* 11, 1304-7.

McDowell, I., Newell, C. (1996). *Measuring Health.* (2nd ed). New York, NY: Oxford.

Mosack, K.E., Petroll, A., (2009). Patients' Perspectives on Informal Caregiver Involvement in HIV Health Care Appointments. *AIDS Patient Care& STDS, 23*(12), 1043-51.

Novak, S.P., Colpe, L.J., Barker, P.R., Gfroerer, J.C. (2010). Development of a brief mental health impairment scale using a nationally representative sample in the USA. *International Journal of Methods in Psychiatric Research, 19*(S1), 49-60.

Office of Women's Health (2012). *Minority Women's Health: HIV/AIDS - 2010.* U.S. Department of Health and Human Services: Washington, DC.

Owe-Larsson, B., Sall, L., Salamon, E., Allgulander, C. (2009) HIV infection and psychiatric illness. *African Journal of Psychiatry*, 12, 115-128.

Parsons, S.K, Cruise, P.L., Davenport, W.M., Jones, V. (2006). Religious Beliefs, Practices and Treatment Adherence Among Individuals with HIV in the Southern United States. *AIDS Patient Care & STDS, 20*(2), 97-111.

Paterson, D.L., Swindells, S., Mohr, J., Brester, M., Vergis, E.N., Squier, C., Wagener, M.M., Singh, N. (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Annals of Internal Medicine, 133*(1), 21-30.

Pearlin, L.I., Mullan, J.T., Aneshensel, C.S., Wardlaw, L.A. (1994). The structure and functions of AIDS caregiving relationships. *Psychosocial Rehabilitation Journal, 17,* 51-67.

Prejean, J., Song, R., Hernandez, A., Ziebell, R., Green, T., Walker, F., Lin, L.S., An, Q., Mermin, J., Lansky, A., Hall, H.I., HIV Incidence Surveillance Group. (2011).

Estimated HIV Incidence in the United States, 2006-2009. *PLOS ONE 6*(8), e17502.

Randall, V., Randall, R. (1993). Racist Health Care: Reforming an Unjust Society to Meet the Needs of African Americans. *Health Matrix: Journal of Law-Medicine*, 3, 127-93.

Robertson, M. (2006). Books reconsidered: Emile Durkheim, Le Suicide. *Australasian Psychiatry*, 14, 365-8.

Schneider, J., Kaplan, S.H., Greenfield, S., Li, W., Wilson, I.B. (2004). Better physician-patient relationships are associated with higher reported adherence to antiretroviral therapy in patients with HIV infection. *Journal of General Internal Medicine,* 19, 1096-1103.

Schumacher, W.E., Frick, M., Kauselmann, V., Maier-Hoyle, R., van der Vliet, R., Babiel, R. (2007). Fully automated quantification of human immunodeficiency virus (HIV) type 1 RNA in human plasma by the COBAS AmpliPrep/COBAS Taqman system. *Journal of Clinical Virology*, 38, 304-12.

Semple, S.J., Patterson T.L., Temoshok L.R., Straits-Tröster K., Atkinson J.H., Koch W., Grant I. (1997). Family Conflict and Depressive Symptoms: A Study of HIV-Seropositive Men. *AIDS & Behavior, 1*(1), 53-60.

Substance Abuse and Mental Health Services Administration. (2013). *Results from the 2012 National Survey on Drug Use and Health: Mental Health Findings*, NSDUH Series H-47, HHS Publication No. (SMA) 13-4805. SAMHSA: Rockville, MD.

Squires, K.E., Hodder, S.L., Feinberg, J., Bridge, D.A., Abrams, S., Storfer, S.P., Aberg, J.A. (2011). Health Needs of HIV-Infected Women in the United States: Insights from The Women Living Positive Survey. *AIDS Patient Care & STDS,* 25, 279-85.

StataCorp. (2009). *Stata 11 Base Reference Manual.* College Station, TX: Stata Press.

StataCorp. (2009). *Stata Statistical Software, Rel. 11.* College Station, TX: StataCorp LP.

Straus, M.A. (1979). Measuring intra family conflict and violence: The Conflict Tactics (CT) Scales. *Journal of Marriage & the Family, 41*(1), 75-88.

Strine, T.W., Chapman, D.P., Balluz, L., Mokdad, A.H. (2008). Health-related quality of life and health behaviors by social and emotional support. *Social Psychiatry and Psychiatric Epidemiology, 43*(2), 151-9.

Tucker, J.S., Burnam, M.A., Sherbourne, C.D., Kung, F.Y., Gifford, A.L. (2003). Substance use and mental health predictors of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *American Journal of Medicine, 114*(7), 573-80.

Turner, B.J., Laine C., Cosler L., Hauck W.W. (2003). Relationship of gender, depression, and health care delivery with antiretroviral adherence in HIV-infected drug users. *Journal of General Internal Medicine*, 18, 248-57.

Vitiello, B., Burnam, M.A., Beckman, R., Shapiro, M.F. (2003). Use of psychotropic medications among HIV-infected patients in the United States. *American Journal of Psychiatry*, 160, 547-54.

Wagner, G. Rabkin, J. (2000). Measuring medication adherence: are missed doses reported more accurately than perfect adherence. *AIDS Care*, 12, 405-8.

Wyatt, G.E. (2002). Does a history of trauma contribute to HIV risk for women of color? Implications for prevention and policy. *American Journal of Public Health, 92*(4), 660-5.

Zea, M., Reisen, C., Poppen, P., Bianchi, F., Echeverry, J. (2005). Disclosure of HIV status and psychological well-being among Latino gay and bisexual men. *AIDS & Behavior, 9*(1), 15-26.

Table 4.1. Demographic characteristics of all participants by sex (*N*=383)

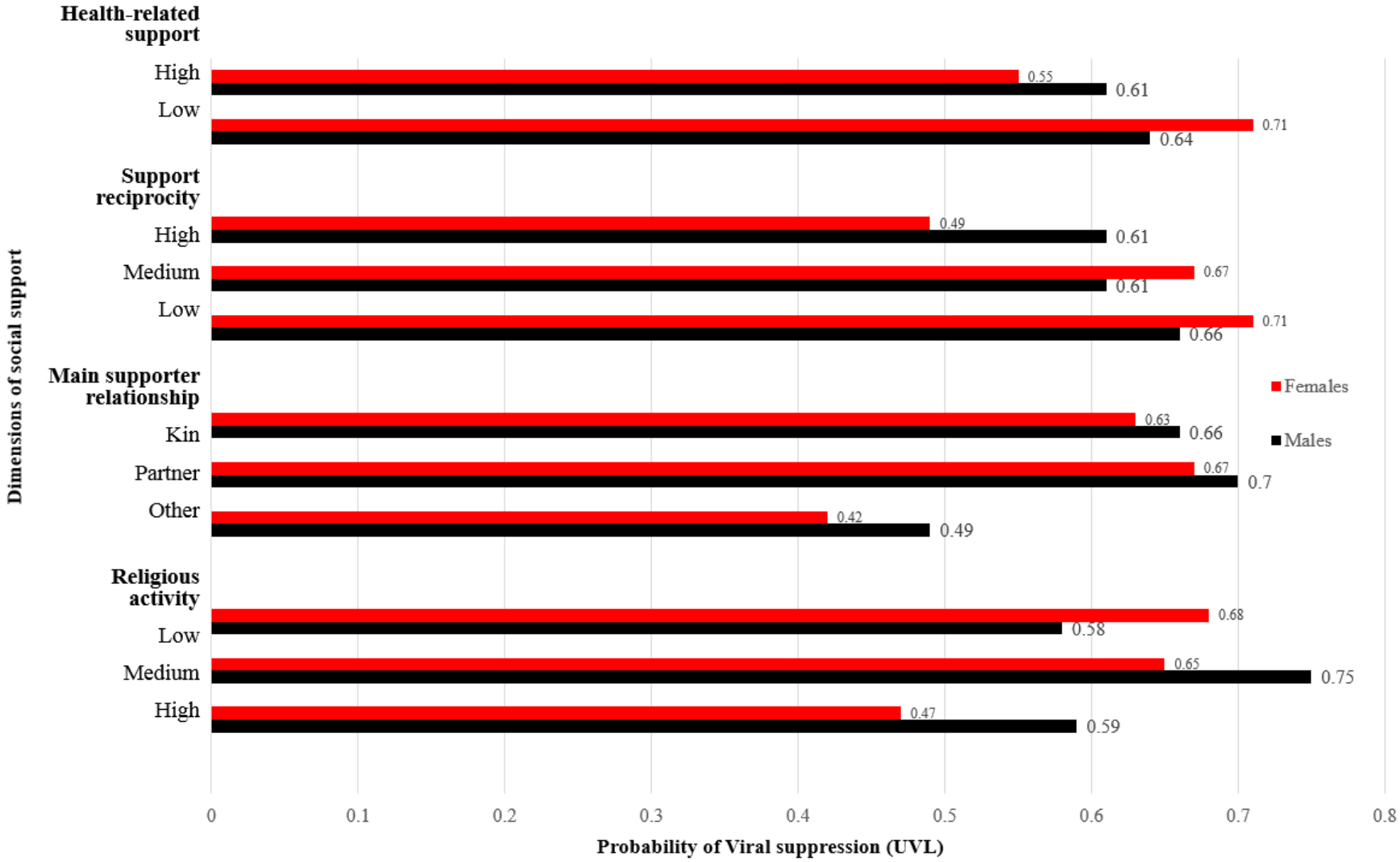
Characteristic	Males (*N*=235) *N*(%) or Mean (SD)	Females (*N*=148) *N*(%) or Mean (SD)	Total *N*(%) or Mean (SD)
Race			
African-American/Black	219 (93.2)	132 (89.2)	351 (91.6)
White	12 (5.1)	15 (10.1)	27 (7.0)
Other	4 (1.7)	1 (0.7)	5 (1.4)
Education			
8th grade or less	15 (6.4)	11 (7.4)	26 (6.8)
Some high school	81 (34.4)	69 (46.6)	150 (39.2)
High school diploma/GED	97 (41.3)	48 (32.4)	145 (37.9)
Some college/above	42 (17.9)	20 (3.5)	62 (16.1)
Active substance use			
0 substances	130 (55.3)	79 (53.4)	209 (54.6)
1-2 substances	81 (34.5)	46 (31.1)	127 (33.2)
3 or more substances	24 (10.2)	23 (15.5)	47 (12.2)
Mental illness			
0 diagnoses	90 (38.3)	32 (21.6)	122 (31.9)
1-2 diagnoses	90 (38.3)	69 (46.6)	159 (41.5)
3 or more diagnoses	55 (23.4)	47 (31.8)	102 (26.6)
Familial conflict			
None	144 (61.3)	98 (66.2)	242 (63.2)
Low	28 (11.9)	16 (10.8)	44 (11.5)
Medium	45 (19.1)	28 (18.9)	73 (19.1)
High	18 (7.7)	6 (4.1)	24 (6.3)
Religious activity			
Low	46 (19.6)	25 (16.9)	71 (18.5)
Medium	104 (44.3)	68 (45.9)	172 (44.9)
High	85 (36.1)	55 (37.2)	140 (36.5)
Physical functioning			
Low	78 (33.2)	57 (38.5)	135 (35.2)
Medium	69 (29.4)	47 (31.8)	116 (30.3)
High	88 (37.4)	44 (29.8)	132 (34.5)
Main supporter type			
Other	65 (27.7)	24 (16.2)	89 (23.3)
Main partner	66 (28.0)	55 (37.2)	121 (31.6)
Kin	104 (44.3)	69 (46.6)	173 (45.2)
Dr-Pat communication			
Low	138 (60.3)	77 (53.5)	215 (57.6)
High	91 (39.7)	67 (46.5)	158 (42.4)
Support reciprocity			
Low	76 (34.7)	31 (22.1)	107 (29.8)
Medium	65 (29.7)	61 (43.6)	126 (35.1)
High	78 (35.6)	48 (34.3)	126 (35.1)
Health-related support			
Low	141 (60.0)	59 (39.9)	200 (52.2)
High	94 (40.0)	89 (60.1)	183 (47.8)
Viral suppression	156 (66.4)	96 (64.9)	252 (65.8)
Age (years)	49.6 (5.7)	45.9 (6.4)	48.2 (6.3)

Table 4.2. Correlates of viral suppression by sex among African-American Indexes

	Males (*N*=199)				Females (*N*=122)			
	IRR[a]	CI[c]	AIR[b]	CI	IRR	CI	AIR	CI
Active substance use								
1-2 substances	0.87	(0.70, 1.08)	0.88	(0.70, 1.09)	0.69*	(0.51, 0.94)	0.73‡	(0.52, 1.03)
3 or more substances	0.99	(0.74, 1.33)	0.91	(0.65, 1.28)	0.61*	(0.37, 1.00)	0.71	(0.45, 1.14)
(ref: 0 substances)	1.00		1.00		1.00		1.00	
Mental illness								
1-2 diagnoses	1.16	(0.94, 1.44)	1.28*	(1.00, 1.63)	1.22	(0.87, 1.72)	1.39‡	(0.99, 1.94)
3 or more diagnoses	1.12	(0.86, 1.45)	1.24	(0.98, 1.91)	1.10	(0.75, 1.62)	1.38	(0.92, 2.08)
(ref: 0 diagnoses)	1.00		1.00		1.00		1.00	
Familial conflict								
Low	0.79	(0.53, 1.17)	0.73	(0.49, 1.09)	0.83	(0.50, 1.37)	1.10	(0.67, 1.80)
Medium	1.15	(0.94, 1.42)	1.18	(0.96, 1.45)	1.22	(0.94, 1.60)	1.48*	(1.08, 2.04)
High	1.13	(0.83, 1.54)	1.37‡	(0.98, 1.91)	1.25	(0.78, 1.99)	1.40	(0.76, 2.60)
(ref: None)	1.00		1.00		1.00		1.00	
Education								
Some high school	1.37	(0.74, 2.53)	1.64	(0.82, 3.29)	1.72	(0.69, 4.30)	2.05	(0.80, 5.30)
High school/GED	1.54	(0.84, 2.82)	1.75	(0.88, 3.48)	1.74	(0.69, 4.37)	2.03	(0.76, 5.39)
Some college/above	1.57	(0.85, 2.92)	1.89‡	(0.94, 3.79)	2.25‡	(0.90, 5.63)	2.60*	(1.00, 6.77)
(ref: 8th grade/less)	1.00		1.00		1.00		1.00	
Physical function								
Med physical func	1.31*	(1.02, 1.69)	1.38*	(1.07, 1.77)	1.00	(0.72, 1.39)	0.94	(0.69, 1.29)
High physical func	1.28*	(1.00, 1.63)	1.27‡	(0.99, 1.64)	1.21	(0.91, 1.61)	1.04	(0.77, 1.41)
(ref: Low phys func)	1.00		1.00		1.00		1.00	
Religious activity								
Medium	1.29*	(1.04, 1.61)	1.26‡	(0.98, 1.62)	1.31	(0.90, 1.92)	1.38‡	(0.96, 1.98)
High	1.05	(0.82, 1.35)	0.98	(0.75, 1.29)	1.46*	(1.03, 2.08)	1.45*	(1.01, 2.08)
(ref: Low)	1.00		1.00		1.00		1.00	
Main support rel'n								
Partner	1.06	(0.82, 1.36)	1.41*	(1.01, 1.99)	1.26	(0.82, 1.93)	1.59*	(1.01, 2.51)
Kin	1.02	(0.81, 1.29)	1.33‡	(0.98, 1.80)	1.24	(0.82, 1.89)	1.51*	(0.98, 2.33)
(ref: Other/No supp)	1.00		1.00		1.00		1.00	
Support reciprocity								
Medium	0.95	(0.75, 1.21)	0.91	(0.70, 1.19)	0.96	(0.74, 1.25)	0.94	(0.72, 1.24)
High	0.93	(0.74, 1.18)	0.92	(0.70, 1.22)	0.69*	(0.48, 0.99)	0.69‡	(0.47, 1.01)
(ref: Low)	1.00		1.00		1.00		1.00	
Dr-Patient comm	0.96	(0.79, 1.17)	0.88	(0.71, 1.07)	1.15	(0.90, 1.48)	1.35*	(1.06, 1.72)
Health-rel support	0.93	(0.77, 1.14)	0.95	(0.76, 1.19)	0.80‡	(0.63, 1.02)	0.78	(0.58, 1.06)

‡*marginally significant* $p<.10$, *$p<.05$, **$p<.01$, ***$p<.001$ [a]IRR = Incidence Rate Ratio [b]AIR = Adjusted Incidence Rate Ratio [c] CI = 95% Confidence Interval

Figure 4.1. Marginal effects of social support dimensions on probability of UVL by sex among African-American Indexes (*N*=321)



CHAPTER FIVE: MANUSCRIPT TWO

Substance use, mental illness, and familial conflict among HIV-positive African-Americans: latent class regression and a new syndemic framework

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ABSTRACT

Objective: Extant research suggests that substance use, mental illness, and familial conflict are associated with negative health outcomes among persons living with HIV (PLHIV). Research also suggests that among African-Americans, women may have higher prevalence of these factors, and consequently, lower likelihood of HIV medical adherence. Therefore, the proposed study explored these factors as a potential latent syndemic among persons who inject drugs (PWID) PLHIV. **Methods:** Data were from baseline of the BEACON study of adult former or current PWID PLHIV on ART, living in Baltimore, Maryland. Latent class analyses (LCA) identified classes representing syndemic risk among African-American participants. LCA regression assessed class membership as a function of sex and of HIV medical adherence, defined as viral suppression and optimal acute services utilization (no ER visits or hospitalizations in the past 6 months). **Results:** Participants were 92% African-American and 61% male (N=383). Fifty-seven percent of participants earned $500-999 monthly, and average age was 48.2 years. Based on LCA, 9% of participants had high substance use/mental illness prevalence (Class 4); 23% had moderate levels of all 3 factors (Class 3); 25% had high mental illness (Class 2); 43% had moderate substance use/mental illness (Class 1; N=331). Compared to Class 4, females had 79% lower odds of being in Class 1 or Class 3 (p<.01). Compared to Class 4, viral suppression odds were 4.6 times higher in Classes 2 or 3 (p<.05). **Discussion:** Odds of HIV medical adherence were 2 to 4 times higher in Classes 1-3 as compared to Class 4. Moreover, Class 4 was overwhelmingly female (68%). While not statistically significant, African-American females were less likely than males to achieve both viral suppression (67.1% vs. 65.9%, non-significant) and optimal acute care utilization (OAU; 53.9% vs. 48.5%, non-significant; N=351). Interventions are needed tailored to African-American PWID PLHIV females, as they are most vulnerable to HIV medical non-adherence and other negative health outcomes. Findings suggest a need for a comprehensive syndemic approach to HIV treatment and adherence interventions, rather than addressing singular vulnerabilities.

Key words: HIV, injection drug use, viral suppression, health disparities, Syndemic Theory, African-Americans

INTRODUCTION

Thirty-five years into the HIV pandemic, advancements have been made in the availability of antiretroviral therapy (ART), reduction of AIDS-related mortality, and awareness of HIV risk among at-risk groups such as men who have sex with men (MSM), and persons who inject drugs (PWID). During the same period, the public's perceptions and demographic characteristics of people living with HIV/AIDS (PLHIV) have also changed. Once viewed as a "gay man's disease", the new faces of PLHIV, are less White-American MSM, and more racial/ethnic minorities and women (Towner, 2008; Centers for Disease Control and Prevention [CDC], 2012). No longer a death sentence, many PLHIV are aging well into older adulthood, though with more co-morbidities than their non-PLHIV counterparts (CDC, 2012; Havlik et al., 2011).

Common HIV co-morbidities, irrespective of age, include viral Hepatitis and tuberculosis, which may complicate the treatment of HIV with ART, due to issues such as multi-drug resistance (CDC, 2012). However, some co-morbidities of HIV stem from behavioral roots, rather than biological causes, and may also complicate HIV-related health behaviors. These common co-occurrences include substance use, mental illness, and interpersonal violence (Kaaya et al., 2013). Irrespective of etiology, when biologic or behavioral occurrences co-present with HIV, and interact in both etiology and prognosis, they comprise a syndemic (Singer, 1996; Singer & Clair, 2003; Goodman & Leatherman, 2001).

Syndemic Theory and HIV-related disparities

Syndemic Theory refers to two or more co-morbid conditions, which interact synergistically, and collectively increase disease burden in a given population (Singer,

1996; Singer & Clair, 2003). As noted by Milstein (2001), syndemics result when health-related problems cluster together either by person, place, or time. The resulting problems have nested or overlapping relationships; therefore, prevention of a syndemic requires prevention and control of each disease, as well as of the forces that cluster them together (Milstein, 2001; Singer & Clair, 2003). Singer (1996) first proposed the '*SAVA*' syndemic, referring to concurrent and mutually reinforcing substance abuse, violence, and HIV infection among low-income and racial/ethnic minority women. A recent study by Illangasekare et al (2013) found that compared to women who with no *SAVA* Syndemic factors, women who had experienced all three factors were significantly more likely to report depressive symptoms.

Since the appearance of the *SAVA* Syndemic in the public health literature, several other syndemics have been proposed and extensively studied to understand HIV-related disparities in infection rates as well as risk behaviors. Meyer et al (2011) reviewed 45 studies related to the *SAVA* Syndemic. Their review of the literature found that the *SAVA* Syndemic relationship relationship among substance use, violence, and HIV was associated with increased engagement in HIV-risk behaviors, mental illness, and lower rates of HIV medical adherence among those infected (Meyer et al., 2011). Their results also noted that individuals with a history in the criminal justice system, irrespective of gender, (i.e., substance use, violence, and HIV infection), had increased rates of violence and drug use which often preceded their incarceration (Meyer et al., 2011).

Related syndemics have also been identified in Hispanic/Latino populations. Gonzalez-Guarda et al (2010) demonstrated that Hispanic/Latino-American men are disproportionately affected by substance abuse, perpetration of intimate partner violence,

and HIV risk. A follow up study in 2011 found a similar syndemic present in Hispanic/Latina-American women, with the additional burden of depressive symptoms, intimate partner violence victimization, and with correlation between the syndemic factors and increased socioeconomic disadvantage (Gonzalez-Guarda et al., 2011). Horner and Nassiri (2013) posit another syndemic may be present among Hispanic/Latinos in the Dominican Republic, comprised of neighborhood effects (e.g. violence), malnutrition (e.g. lack of nutritional food sources), and HIV/AIDS infection (e.g. social inequalities and lack of medical care predisposing individuals to HIV).

Much like racial/ethnic minorities and/or women, MSM are at disparate risk of HIV and ill-health outcomes. An MSM syndemic involving the additivity of substance abuse, emotional distress, adult victimization, and history of sexual abuse, irrespective of race, has been extensively described (Stall et al., 2003; Mustanski et al., 2007; Kurtz, 2008; Starks et al., 2014). Halkitis et al (2013) found that syndemic mental health burden and drug use were associated with unprotected sex, and Halkitis et al (2012) found these syndemic factors present among older MSM PLHIV. Finally, due to victimization and marginalization and increased rates of commercial sex work, transgender individuals experiencing syndemic threats of mental illness, violence, and substance abuse, are subsequently at increased risk of unprotected sex and HIV risk, and may experience more stigmatization than MSM and other PLHIV (Brennan et al., 2012; DeSantis 2009; Operario & Nemoto, 2010).

Finally, several commonalities exist among the various HIV-related syndemics. First, nearly all of the syndemics that have been investigated posit that substance use and violence predict increased HIV risk, and primarily occur in low-income and racial/ethnic

minority populations (Senn et al., 2010). Next, among women and MSM, mental illness is a common syndemic factor as well (Meyer et al., 2011). Moreover, the majority of syndemic models that have been investigated conceptualize women as having greater risk of factors precipitating HIV infection – including higher prevalence of intimate partner violence victimization, mental illnesses, and socioeconomic disadvantange. Lastly, nearly all of these syndemics examine primary HIV prevention by focusing on HIV-related risk behavior and HIV infection outcomes, in lieu of tertiary prevention of HIV-related burden among PLHIV.

A new framework – The *SUMIC* Syndemic and African-American PLHIV

Disparities in HIV-related outcomes due to race and gender are well documented, such that African-Americans and women bear the largest burden of the disease (CDC, 2012). Theoretical orientations such as Syndemic Theory help to characterize the hypothesis that those most vulnerable to these dispairities are African-Americans experiencing syndemic health threats from mental illness, substance use, and familial conflict. The *'SUMIC'* Syndemic (e.g. ***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict), places African-Americans, and particularly African-American women, at high risk of death and/or disability related to HIV/AIDS in the United States. Among African-American PLHIV within the *SUMIC* Syndemic, temporal patterns in risk may vary.

First, persons who inject drugs are at increased risk of HIV infection compared to non-users, as injection drug use is a more efficient route of HIV transmission than unprotected sex (CDC, 2012). Mental illness often co-occurs with substance use, both of which may predict increased risk of negative HIV outcomes, from primary infection to ART non-adherence (Kaaya et al., 2013; Senn & Carey, 2008; Wyatt, 2002; Zierler &

Krieger, 1997). Consequently, many substance users report having been diagnosed and treated for depression, schizophrenia, manic depressive disorder, and other serious mental illness (Senn & Carey, 2008; Latkin et al., 2002; Johnson et al., 2008). Finally, familial conflict refers to verbal and/or physical abuse between kin members, which is often if chronic (Dunbar, 1990; Chesney & Folkman, 1994).

Literature on familial conflict and HIV posits that an HIV diagnosis represents a chronic stressor, which may then trigger substance use and/or mental illness (Semple et al., 1997; Chesney & Folkman, 1994; Zea et al., 2005; Li et al., 2012). Consideration of familial conflict as a syndemic factor builds upon literature in the aforementioned *SAVA* Syndemic, which refers to intimate partner violence among women and HIV risk (Singer, 1996). Extant literature posits that syndemic health threats such as mental illness, substance use, and intimate partner violence are associated with increased likelihood of HIV risk. However, few studies have examined the larger construct of familial conflict as a non-gender-specific health determinant, to inform tertiary prevention of HIV health complications (Minze et al., 2010; Sanders-Phillips, 2002; Jones, Beach, Forehand, & Foster, 2003).

Purpose

The dearth of theoretically-informed, tertiary HIV prevention programs geared towards African-Americans is a gap in the literature (Johnson et al., 2008; Gielen et al., 2005; Tobin et al., 2011; McDaid & Hart, 2010). To date, only two studies have applied Syndemic Theory to assess the effects of syndemic factors on ART adherence (Blashill et al., 2014; Mizuno et al., 2014). Blashill et al (2014) found that syndemic effects of factors

including childhood abuse, current violence, and alcohol or substance abuse were associated with lower ART adherence. Additionally, Mizuno et al (2014) found that persons with four or more syndemic problems, were less likely to be virally suppressed than those with less syndemic problems. However, assessment of Syndemic Theory in a sample of all African-American PWID PLHIV, using latent class analyses, has not been conducted to our knowledge. Therefore, the purpose of the proposed research was to examine the presence and correlates of a potential latent syndemic in a cohort of African-American PLHIV. Specifically, study aims were to: (a) assess active substance use, mental illness, and familial conflict as a potential latent syndemic; and (b) examine syndemic patterns as a function of HIV medical adherence and sex.

Previous research suggests that, compared to African-American men, African-American women have higher rates of mental illness, and lower rates of access to HIV care (Buseh & Stevens, 2008; Gullette et al., 2010). Thus, it was hypothesized that: 1) women comprise the individuals with the highest prevalence of the proposed *SUMIC* Syndemic; and 2) individuals with higher syndemic burden would have lower prevalence of HIV medical adherence than individuals with lower syndemic burden. This study was unique in examining tertiary prevention of HIV medical adherence, rather than primary prevention of HIV infection among African-Americans, to improve HIV health outcomes.

METHODS

Procedure

Data were from the baseline survey of the Being Active and Connected (BEACON) study, which examined psychosocial factors associated with health outcomes and well-being among disadvantaged PLHIV. Study participants were HIV-positive

former and current persons who inject drugs residing in Baltimore City. Inclusion criteria were: (a) age of 18 years or older; (b) documented HIV seropositive status; (c) current or former injection drug use; (d) current use of ART regimen defined as use in the prior 30 days; and (e) willingness to recruit at least one supportive partner to the study. All participants completed baseline and follow-up assessments. Serum viral load, CD4 count data, and toxicology tests were collected at baseline and 6 month visits for all participants. Participants were recruited through street outreach, community sampling, and targeted strategies. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved the study.

Measures

Dependent variable

SUMIC Syndemic latent class membership was the outcome of interest. Latent class analyses (LCA) were conducted to identify unique patterns of behavioral risk. Therefore, the *SUMIC* Syndemic latent classes were participants' most likely membership classes, based on posterior probability of endorsing items referring to Participants' active substance use, mental illness diagnoses, and familial conflict (Ahn et al., 2008; Collins & Lanza, 2010). Active substance use was made up of six items, coded as use of opiates, marijuana, heroin, cocaine or crack, hallucinogens, and/or prescription drug use in the past month; each item was binary (coded 0 = no use and 1 = use in past 30 days). Mental illness was made up of five items, coded as having ever been diagnosed by a doctor with major depression, bipolar disorder, anxiety or post-traumatic stress disorder (PTSD), schizophrenia, and/or any other psychiatric condition. Each item was binary (coded 0 = not diagnosed and 1 = ever diagnosed). Familial conflict was made up of three

items, coded as if current family members rarely discussing problems, problem-solving together, and/or show caring for one another. Each item was binary, where 0 = no conflict, and 1 = frequent conflict. Familial conflict questions were based on the Conflict Tactics Scale, which assesses constructs of intra-family aggression and conflict resolution (Straus, 1979).

Independent variables

HIV medical adherence was defined as level of optimal acute care utilization and HIV viral suppression. Optimal acute care utilization (OAU) was measured via a cumulative score of access to health care services and level of engagement in HIV medical services. This definition is based on The HIV Cost and Service Utilization Study (HCSUS), which defines optimal service utilization as prompt engagement in HIV care after diagnosis, minimization of acute care, and successful ART adherence (Fremont et al., 2007). Respondents reported numeric responses to the following: "In the past 6 months, how many times have you gone to an emergency room (ER) for your health care?", and "In the past 6 months, how many times were you admitted to a hospital, that means that you stayed there overnight?" Responses were summed and dichotomized at the median, where 0 = 1 or more ER visits and/or overnight hospitalizations in the last 6 months (suboptimal acute care utilization), and 1 = 0 ER visits or overnight hospitalizations in the last 6 months (OAU; MacCallum et al., 2002). In the present study, participants were nearly all insured and enrolled in care, and therefore should have had less reason to access acute care services. Therefore, while informed by the HCSUS study, the outcome of interest OAU focused specifically on acute care, as opposed to other types of healthcare utilization.

HIV viral suppression was defined as a viral load of 40 copies per milliliter (mL) or less, as measured by the Roche Cobas Amplicor viral load assay (Schumacher et al., 2007). A dichotomous variable of viral suppression was constructed, where 0 = detectable viral load (greater than 40 copies/mL) and 1 = undetectable viral load (UVL), or viral suppression (less than 40 copies/mL). Finally, sex was a binary variable included in survey questionnaires, coded as 1= Males, and 2 = Females.

Data analyses

First, univariate statistics were calculated among the entire sample of participants (*N*=383). Relevant summary statistics were generated for: (a) demographic variables: sex, age, race, educational attainment, and monthly income; (b) substance use, mental illness, and familial conflict items; and (c) HIV medical adherence (viral suppression and optimal acute care utilization). Next, factor analyses were conducted to assess the factor structure and internal reliability of the items for each *SUMIC* Syndemic factor. A latent one-factor structure of the 6 binary active substance use items yielded acceptable fit (Chi-square [χ^2] = 11.37; Degrees of freedom [df] = 9; Root Mean Square Error of Approximation [RMSEA] = 0.03; Comparative Fit Index [CFI] = 1.00; Rasch, 1980). A latent one-factor structure of the 5 binary mental illness items yielded acceptable fit (χ^2 = 2.41; df = 5; RMSEA = 0.00; CFI = 1.00; Rasch, 1980).

Factor analyses was conducted to account for a latent one-factor structure of the 3 binary familial conflict items, which yielded acceptable fit (χ^2 = 0.00; df = 0; RMSEA = 0.00; CFI = 1.00; Rasch, 1980). Third, LCA was used as a data reduction technique by which to categorize individuals into their most likely class membership along the spectrum of the *SUMIC* Syndemic (e.g. non-observable latent variable, based on the

latent conditions of active substance use, mental illness, and familial conflict; Bastard et al., 2011; Ahn et al., 2008; Collins & Lanza, 2010). Fourth, the syndemic classes were regressed on the three relevant correlates: sex, viral suppression (UVL), and optimal acute care utilization (OAU). Comparisons were made about class membership as a function of sex and HIV medical adherence (e.g. UVL and OAU). Odds ratios were analyzed as an acceptable approximation of relative risk, given that the LCA outcome of interest, *SUMIC* Syndemic Class 4 was rare (less than 10%; McNutt et al., 2003).

LCA were run with solutions ranging from two classes to six classes with African-American Participants only (*N*=351). Analyses were conducted on complete cases only, due to acceptable missingness (less than 10%; Bennett, 2001). Both theory and fit statistics were utilized to select the best model for the data, including Akaike's Information Criteria (AIC; Akaike, 1973). Descriptive analyses were run in Stata Version 11.2 SE (StataCorp, 2009), and all latent factor analyses and LCA were run using MPlus Version 7.0 (Muthén & Muthén, 2011).

RESULTS

Descriptive statistics

Table 5.1 reports demographic characteristics of all participants (*N*=383). Participants were predominantly African-American (91.6%), male (61.4%), and earned a monthly income between $500 to $999 (57.2%). Most participants had attended high school and/or had earned a high school diploma or GED (39.2% and 37.9%, non-significant), and also had a history of ever being in jail or prison (84.1%). Half of participants achieved optimal acute care utilization (50.9%). Two-thirds achieved viral

suppression (65.8%). Mean age was 48.2 years. Among African-American participants only, cocaine/crack (33.7%) and heroin (20.8%) were the substances most frequently used (*N*=351*;* Table 5.2). Depression (59.5%) and bipolar disorder (33.1%) were the most common mental illness diagnoses. The most frequent familial conflicts were families rarely or never talking about problems (29.9%), and rarely or never problem-solving (28.2%).

Class 1: Moderate Substance use/Mental illness

Individuals in Class 1 (43% of the sample population) were less likely than Classes 3 and 4 to report active use of all substances except prescription drug use (e.g, opiates, marijuana, heroin, cocaine, hallucinogens). Their active substance use was moderate, compared to Class 2 (higher rates) and/or Class 4 (lower rates). Class 1 individuals were least likely of all class members to report a mental illness diagnosis, though nearly 30% had a depression diagnosis ($p<.01$). These individuals were least likely to endorse experiencing familial conflict, such that only 6.6% endorsed rarely or never talking about problems with their families ($p<.01$). Thus, Class 1 has the lowest burden of the *SUMIC* Syndemic, and were the sample majority (Table 5.3 and Figure 5.1).

Class 2: High Mental illness

Individuals in Class 2 were the least likely of all class members to report active substance use (25% of sample population; Table 5.3). They also had the second lowest rates of familial conflict (12.4%; $p<.05$). However, these individuals reported the second highest rates of depression diagnoses (92.5%; $p<.001$) and the second-highest rates of anxiety/PTSD diagnoses (43%; $p<.01$). Additionally, over two-thirds of Class 2

individuals had been diagnosed with bipolar disorder (68.6%; $p<.001$). This class had low prevalence of active substance use and familial conflict overall; thus they have lower *SUMIC* Syndemic burden than both Classes 3 and 4 (Table 5.3 and Figure 5.1).

Class 3: Moderate Substance use and Mental illness/High Familial conflict

Class 3 individuals had moderate to high rates of all *SUMIC* Syndemic factors (23% of sample; Table 5.3). These individuals reported the second-highest rates of active cocaine use (41.4%), marijuana use (21.8%), and heroin use (23.6%) out of all 4 classes. Nearly two-thirds of Class 3 individuals had a depression diagnosis ($p<.001$), and one-third had a bipolar disorder diagnosis ($p<.001$). These individuals reported the highest rates of familial conflict, where over 93% of individuals reported that their families rarely or never talk about problems and rarely or never problem solves together (93.9% and 95.9%, respectively; $p<.001$; Figure 5.1).

Class 4: High Substance use/High Mental illness

Individuals in Class 4 (9% of the sample) were most likely to report active cocaine use (100%), marijuana use (47.9%), and heroin use (71.3%) out of all participants. While individuals reported 4% or less endorsement of prescription drug use in Classes 1-3, one-quarter of Class 4 individuals reported active prescription drug use ($p<.01$). These individuals also had the highest rates of all mental illness diagnoses (e.g. depression – 95.2%, bipolar disorder – 75.6%, anxiety/PTSD – 61.2%). Class 4 individuals had the highest rates of active substance use and mental illness, and the second-highest rates of familial conflict; thus they comprise the class with the highest *SUMIC* Syndemic burden (Figure 5.1).

Latent class logistic regression results

Table 5.4 reports latent class regression odds ratios, where *SUMIC* Syndemic class membership was regressed on viral suppression (UVL), optimal acute care utilization (OAU), and sex among African-American participants (*N*=351). Compared to the class with the highest *SUMIC* Syndemic burden (Class 4), individuals with the lowest *SUMIC* Syndemic burden (Class 1) had 80% fewer odds of being female (Odds Ratio [OR] = 0.21; 95% Confidence Interval [95% CI] = 0.01, 0.61). Class 1 individuals were 5 times as likely to achieve OAU as Class 4 individuals (OR = 5.03; 95% CI = 1.38, 18.39). Females were more likely to be in Class 4 than males, and less likely to be in Class 1. Therefore, females were more likely to have highest *SUMIC* Syndemic burden, and less likely to achieve OAU than males. Post-hoc analyses show that 69% of Class 4 individuals were females (Figure 5.2).

Compared to Class 4, individuals with high mental illness only (Class 2) had 4.6 times the odds of UVL (95% CI = 1.48, 14.29). Individuals in Classes 1 and 4 were more likely to have detectable viral load than to have achieved UVL (Figure 5.3). In contrast, individuals in Classes 2 and 3 were mostly virally suppressed. Individuals in Classes 1 and 3 were more likely to have achieved OAU, as opposed to suboptimal acute care utilization. Compared to Class 4, individuals with moderate rates of all *SUMIC* Syndemic factors (Class 3) had odds of UVL and OAU between 4 and 6 times greater; they were significantly more likely to be male, and to have achieved HIV medical adherence. Finally, Classes 2 and 4 individuals were more likely to have suboptimal acute care utilization than other classes (Figure 5.4). Fifty-one percent of Class 2 were female. Females were less likely to achieve medical adherence than males, and were the majority

of the individuals in Classes 2 and 4, thereby supporting both study hypotheses.

DISCUSSION

Our study results suggest that, among disadvantaged African-American PLHIV, active substance use, mental illness, and familial conflict are very common. This is logical, given that extant research suggests that these factors are both common predecessors of HIV infection as well as frequent outcomes after HIV diagnosis (Kaaya et al., 2013; Senn & Carey, 2008; Wyatt, 2002; Zierler & Krieger, 1997; Johnson et al., 2008; Chesney & Folkman, 1994; Zea et al., 2005; Li et al., 2012). Furthermore, our results suggest that these factors lend themselves well to application of Syndemic Theory. Our latent class analyses (LCA) reveal that the *'SUMIC'* Syndemic (e.g. ***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict) approach yielded four distinct classes of behavioral risk patterns within the study population (Table 5.3 and Figure 5.1), each with differential burden of the aforementioned factors.

Several previous investigations of syndemic classes have utilized LCA as a meaningful way to classify subtypes of individuals based on their unique behavioral patterns of HIV risk, to inform treatment interventions (Keiser et al., 2012; Noor et al., 2014; Brinkley-Rubinstein & Craven, 2014; Halkitis et al., 2012; Konda et al., 2011). Present LCA yielded a four-class solution, with low AIC, Bayesian Information Criteria, and high Entropy, along with theoretical meaningfulness (Akaike, 1973; Table 5.5). The majority of participants were individuals whose most likely class membership was Class 1 (43%; *N*=351). Post-hoc analyses revealed that 56% of Class 1 individuals were aged 49 and older, and most had achieved HIV medical adherence (both UVL and OAU =

60%). Therefore, the majority of African-American PLHIV in this study had relatively low *SUMIC* burden and older age, both of which correlate with viral suppression (Nicholas et al., 2014; CDC, 2012).

In sharp contrast, findings indicated that 69% of the individuals with the largest burden of *SUMIC* Syndemic factors (Class 4: High substance use/Mental illness) were females, thereby supporting our first study hypothesis. Next, we hypothesized that females would report lower HIV medical adherence, as a result of increased *SUMIC* Syndemic burden. While not statistically significant, post-hoc analyses revealed that African-American females were less likely than African American males to achieve both viral suppression (UVL; 67.1% vs. 65.9%, non-significant) and optimal acute care utilization (OAU; 53.9% vs. 48.5%, non-significant). Moreover, latent class regression analyses indicated that all three other classes had higher odds of both UVL and OAU as compared to Class 4 (Table 5.3), thereby supporting our second hypothesis. These results suggest that interventions to increase HIV medical adherence among African-American PLHIV should target African-American women, as they are more likely than men to suffer from concurrent and mutually reinforcing *SUMIC* Syndemic factors and low adherence (Towner, 2008; CDC, 2012; Prejean et al., 2011). Classes 2 and 3 were individuals with moderate *SUMIC* Syndemic burden (*N*=351). Nearly 80% of individuals in both classes had achieved UVL; however, only 38% of Class 2 individuals, and 64% of Class 3 individuals achieved OAU. Therefore, these syndemic factors do not have similar effects on UVL and acute services use, and higher prevalence and substance use, regardless of familial conflict level, is associated with increased acute services use.

While few studies have examined Syndemic Theory among African-American

PLHIV, there are some similarities between our results and previous investigations. First, congruent to most previous syndemic models, the present sample was low-income racial minorities, with high rates of substance use, mental illness, and moderate to high rates of familial conflict (violence; Senn et al., 2010). Next, the only other studies to date which have investigated Syndemic Theory and ART outcomes, multiple syndemic issues, including but not limited to childhood abuse, current violence (familial conflict), and substance use were associated with lower ART adherence and viral suppression (Mizuno et al., 2014; Blashill et al., 2014). Our results suggest that Class 4 individuals, with the highest rates of concurrent substance use and mental illness diagnoses, were least likely of all classes to achieve either viral suppression or optimal acute care utilization and were mostly women (Table 5.4). Similarly, Illangasekare et al (2013) found that women with syndemic substance use, violence, and HIV-seropositivity had seven times the risk of depression as women with no syndemic factors, suggesting high disadvantage due to syndemic risk among women. The present study expands these findings, by assessing these factors among both males and females, whom have a similar history of drug use.

Therefore, interventions to increase HIV medical adherence in this population should promote use of usual healthcare providers, which 70% of study participants reported having access to. Finally, results suggest that interventions to increased HIV medical adherence among African-American PLHIV within the *SUMIC* Syndemic must address mental illness, as all 4 classes of Syndemic individuals reported at least moderate depression (range: 27% to 95.2%) and bipolar disorder (range: 33.5% to 75.6%), among other diagnoses. This is congruent with extant literature, given that rates of depression among PLHIV are estimated as twice that of the general public (Kaaya et al., 2013).

Limitations

There are several limitations to consider in this study. First, the median time since diagnosis was ten years prior to the beginning of the BEACON study, and participants were nearly all African-American, middle-aged, current or former persons who inject drugs, with access to regular healthcare and ART. Therefore, these population characteristics limit the generalizability of our findings beyond other similar populations. Second, as reported in Table 5.4, several logistic regression odds ratios had large confidence intervals, suggesting that the sample size may have been insufficient to detect all statistically significant findings. Third, while the use of optimal acute care utilization builds on the prior HCSUS study definition (Fremont et al., 2007), reasons for acute care utilization in the sample were unknown and therefore use may not be suboptimal. Fourth, the data were cross-sectional, while study constructs such as adherence may change over time. Finally, there is controversy about the establishment of causal associations (temporality) of syndemic factors. However, from a treatment perspective, presence of *SUMIC* Syndemic factors may hold more precedence than temporality.

Conclusions

Despite these limitations, this study is the first to theorize and test the *SUMIC* Syndemic among a cohort of African-American PLHIV, and the second to apply Syndemic Theory to ART adherence outcomes (Blashill et al., 2014). This study builds upon previous research in Syndemic Theory (Milstein, 2001; Singer & Clair, 2003; Senn, Carey, & Variable, 2010), and contributes a new framework for conceptualizing HIV disparities to promote tertiary HIV prevention. Moreover, results substantiate comprehensive treatment of syndemic factors among African-American PLHIV (Senn et

al., 2010). While the *SUMIC* Syndemic is non gender-specific, interventions must consider gender differences in outcomes such as HIV medical adherence, such that women may have unique contextual factors which reduce their likelihood of adherence.

These factors may include less financial resources and more homelessness, lower perceived social support, and competing priorities that interfere with medical adherence, such as having an HIV-positive significant other for whom they provide care (Blank, 2014; Edwards, 2006; Knowlton et al., 2011). Therefore, future research should consider homelessness and syndemic factors in HIV medical adherence among PWID PLHIV. From an intervention standpoint, the present findings and other recent literature suggest that structural competence training with healthcare providers may increase their understanding of how social systems impact the patient outcomes, beyond culture (Metzl & Hansen, 2014). This comprehensive approach, coupled with gender-specific and culturally-appropriate interventions are needed to reduce stigmatization of substance use, barriers to HIV-related care, and mental illness treatments, to ultimately improve HIV health outcomes in this population.

REFERENCES

Ahn, J., McCombs, J.S., Jung, C., Croudace, T.J., McDonnell, D., Ascher-Svanum, H., Edgell, E.T., Shi, L. (2008). Classifying patients by antipsychotic adherence patterns using latent class analysis: characteristics of nonadherent groups in the California Medicaid (Medi-Cal) program. *Value in Health, 11*(1), 48-56.

Akaike, H. (1973). Information theory and an extension of the maximum likelihood principle. In Second International Symposium on Information Theory. Budapest, Hungary.

Bastard, M., Koita, F.M., Laniece, I., Taverne, B., Desclaux, A., Ecochard, R., Sow, P.S., Delaporte, E., Etard, J.F. (2011). Revisiting long-term adherence to HAART in Senegal using latent class analysis. *Journal of Acquired Immune Deficiency Syndrome, 57*(1), 55-61.

Bennett, D.A. (2001). How can I deal with missing data in my study? *Australian and New Zealand Journal of Public Health*, 25, 464-69.

Blank, M.B. (2014). Homelessness, Mental Illness, Substance Abuse, and HIV: An Insidious Syndemic. *HIV/AIDS Research & Treatment Open Journal, 1*(1), e001-4.

Blashill, A.J., Bedoya, C.A., Mayer, K.H., O'Cleirigh, C., Pinkston, M.M., Remmert, J.E., Mimiaga, M.J., Safren, S.A. (2014). Psychosocial Syndemics are Additively Associated with Worse ART Adherence in HIV-Infected Individuals. *AIDS & Behavior*, (Epub), doi: 10.1007/s10461-014-0925-6.

Brennan, J., Kuhns, L.M., Johnson, A.K. Belzer, M., Wilson, E.C., Garofalo, R., Adolescent Medicine Trials Network for HIV/AIDS Interventions. (2012). Syndemic theory and HIV-related risk among young transgender women: the role of multiple, co-occurring health problems and social marginalization. *American Journal of Public Health, 102*(9), 1751-7.

Brinkley-Rubinstein, L., Craven, K. (2014). A Latent Class Analysis of Stigmatizing Attitudes and Knowledge of HIV Risk among Youth in South Africa. *PLOS ONE 9*(2), e89915.

Buseh, A.G., Stevens, P.E. (2008). Constrained But Not Determined by Stigma: Resistance by African-American Women Living with HIV. *Women & Health, 44*(3), 1-18.

Centers for Disease Control and Prevention [CDC]. (2012). HIV in the United States: The Stages of Care, 2012. *Retrieved September 17, 2014, from* http://www.cdc.gov/nchhstp/newsroom/docs/2012/Stages-of-Care FactSheet-508.pdf

Chesney, M.A., Folkman, S. (1994). Psychological impact of HIV disease and implications for intervention. *Psychiatric Clinics of North America,* 17, 163-82.

Collins, L.M., Lanza, S.T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences.* New York, NY: Wiley Publishing.

Dunbar, J. (1990). *Predictors of patient adherence: Patient characteristics*. In S.A. Shumaker, E.B. Schron, & J.K. Ockene (Eds.). The handbook of health behavior change (pp. 348-360). New York, NY: Springer Publishing.

Fremont, A., Young, A., Chinman, M., Pantoja, P., Morton, S.C., Koegel, P., Sullivan, J.G., Kanouse, D.E. (2007). Differences in HIV Care Between Patients with and Without Severe Mental Illness. *Psychiatric Services, 58*(5), 681-8.

Gielen, A.C., McDonnell, K.A., O'Campo, P.J., Burke, J.G. (2005). Suicide risk and mental health indicators: Do they differ by abuse and HIV status? *Women's Health Issues,* 15, 89-95.

González-Guarda, R.M., McCabe, B.E., Florom-Smith, A., Cianelli, R., Peragallo, N. (2011). Substance Abuse, Violence, HIV, and Depression An Underlying Syndemic Factor Among Latinas. *Nursing Research*, *60*(3), 182-9.

González-Guarda, R.M., Ortega, J., Vasquez, E.P., De Santis, J. (2010). La mancha negra: Substance abuse, violence, and sexual risks among Hispanic males. *Western Journal of Nursing Research, 32*(1), 128-48.

Goodman, A.H., Leatherman, T.L. (2001). *Building a New Biocultural Synthesis: Political-Economic Perspectives on Human Biology*. Ann Arbor: University of Michigan Press.

Gullette, D.L., Wright, P.B., Booth, B.M., Stewart, K.E. (2010). Stages of Change, Decisional Balance, and Self-Efficacy in Condom Use Among Rural African-American Stimulant Users. *Journal of Associated Nurses AIDS Care, 20*(6), 428-41.

Halkitis, P.N., Moeller, R.W., Siconolfi, D.E., Storholm, E.D., Solomon, T.M., Bub, K.L. (2013). Measurement model exploring a syndemic in emerging adult gay and bisexual men. *AIDS & Behavior, 17*(2), 662-73.

Halkitis, P.N., Kupprat, S.A., Hampton, M.B., Perez-Figueroa, R., Kingdon, M., Eddy, J.A., Ompad, D.C. (2012). Evidence for a Syndemic in Aging HIV-positive Gay, Bisexual, and Other MSM: Implications for a Holistic Approach to Prevention and Healthcare. *Natural Resource Modeling, 36*(2), 1-21.

Havlik, R.J., Brennan, M., Karpiak, S.E. (2011). Comorbidities and depression in older adults with HIV. *Sexual Health,* 8, 551-9.

Horner, P., Nassiri, R. (2013). Social Cultural Stressors in Dominican Republic HIV/AIDS Prevention and Treatment. *Journal of AIDS & Clinical Research,*

4(242), 1-6.

Illangasekare, S., Burke, J., Chander, G., Gielen, A. (2013). The syndemic effects of intimate partner violence, HIV/AIDS, and substance abuse on depression among low-income urban women. *Journal of Urban Health, 90*(5), 934-7.

Johnson, W.D., Diaz, R.M., Flanders, W.D., Goodman, M., Hill, A.N., Holtgrave, D., Malow, R., McClellan, W.M. (2008). Behavioral interventions to reduce risk for sexual transmission of HIV among men who have sex with men. *Cochrane Database of Systematic Reviews*, 3, CD001230.

Jones, D.J., Beach, S.R., Forehand, R., Foster, S.E. (2003). Self-Reported Health in HIV-Positive African-American Women: The Role of Family Stress and Depressive Symptoms. *Journal of Behavioral Medicine, 26*(6), 577-99.

Kaaya, S., Eustache, E., Lapidos-Salaiz, I., Musisi, S., Psaros, C., Wissow, L., (2013). Grand Challenges: Improving HIV Treatment Outcomes by Integrating Interventions for Co-Morbid Mental Illness. *PL0S Medicine, (10*)5: e1001447.

Keiser, O., Spycher, B., Rauch, A., Calmy, A., Cavassini, M., Glass, T.R., Nicca, D., Ledergerber, B., Egger, M., Swiss HIV Cohort Study (2012). Outcomes of Antiretroviral Therapy in the Swiss HIV Cohort Study: Latent Class Analysis. *AIDS & Behavior,* 16, 245-55.

Konda, K.A., Celentano, D.D., Kegeles, S., Coates, T.J., Caceres, C.F., NIMH Collaborative HIV/STD Prevention Trial Group (2011). Latent Class Analysis of Sexual Risk Patterns Among Esquineros (Street Corner Men) a Group of Heterosexually Identified, Socially Marginalized Men in Urban Coastal Peru. *AIDS & Behavior*, 15, 862-8.

Kurtz, S.P. (2008). Arrest histories of high-risk gay and bisexual men in Miami: unexpected additional evidence for syndemic theory. *Journal of Psychoactive Drugs, 40*(4), 513-21.

Latkin, C.A., Forman, V., Knowlton, A., Sherman, S. (2002). Norms, social networks, and HIV-related behaviors among urban disadvantaged drug users. *Social Science & Medicine*, 56, 465-76.

Li, L., Ji, G., Ding, Y., Tian, J., Lee, A. (2012). Perceived burden in adherence of antiretroviral treatment in rural China. *AIDS Care, 24*(4), 502-8.

MacCallum, R.C., Zhang, S., Preacher, K.J., Rucker, D.D. (2002). On the Practice of Dichotomization of Quantitative Variables. *Psychological Methods, 7*(1), 19-40.

McDaid, L.M., Hart, G. (2010). Sexual risk behaviour for transmission of HIV in men who have sex with men: recent findings and potential interventions. *Current Opinion in HIV & AIDS, 5*(4), 311-15.

McNutt, L., Wu, C., Xue, X., Hafner, J.P. (2003). Estimating the relative risk in cohort studies and clinical trials of common outcomes. *American Journal of Epidemiology*, 157, 940-3.

Metzl, J.M., Hansen, H. (2014). Structural competency: Theorizing a new medical engagement with stigma and inequality. *Social Science & Medicine*, 103, 126-33.

Meyer, J.P., Springer, S.A., Altice, F.L. (2011). Substance abuse, violence, and HIV in women: a literature review of the syndemic. *Journal of Women's Health, 20*(7), 991-1006.

Milstein, B. (2001). Introduction to the Syndemics Prevention Network. *Retrieved September 14, 2014 from* http://www.cdc.gov/syndemics/.

Minze, L.C., McDonald, R., Rosentraub, E.L., Jouriles, E.N. (2010). Making sense of family conflict: intimate partner violence and preschoolers' externalizing problems. *Journal of Family Psychology, 24*(1), 5-11.

Mizuno, Y., Purcell, D.W., Knowlton, A.R., Wilkinson, J.D. Gourevitch, M.N., Knight, K.R. (2014). Syndemic Vulnerability, Sexual and Injection Risk Behaviors, and HIV Continuum of Care Outcomes in HIV-Positive Injection Drug Users. *AIDS & Behavior,* (Epub), doi: 10.1007/s10461-014-0890-0.

Mustanski, B., Garofalo, R., Herrick, A., Donenberg, G. (2007). Psychosocial health problems increase risk for HIV among urban young men who have sex with men: preliminary evidence of a syndemic in need of attention. *Annals of Behavioral Medicine, 34*(1), 37-45.

Muthén, L.K., Muthén, B.O. (2011). Mplus User's Guide. Seventh Edition. Los Angeles, CA: Muthén & Muthén.

Nicholas, P.K., Willard, S., Thompson, C., Dawson-Rose, C., Corless, I.B., Wantland, D.J., Sefcik, E.F., Nokes, K.M., Kirksey, K.M., Hamilton, M.J., Holzemer, W.L., Portillo, C.J., Mendez, M.R., Robinson, L.M., Rosa, M., Human, S.P., Cuca, Y., Huang, E., Maryland, M., Arudo, J., Eller, L.S., Stanton, M.A., Driscoll, M., Voss, J.G., Moezzi, S. (2014). Engagement with Care, Substance Use, and Adherence to Therapy in HIV/AIDS. *AIDS Research & Treatment*, 2014, 1-7.

Noor, S.W.B., Ross, M.W., Lai, D., Risser, J.M. (2014). Use of Latent Class Analysis Approach to Describe Drug and Sexual HIV Risk Patterns among Injection Drug Users in Houston, Texas. *AIDS & Behavior,* 18, S276-83.

Operario, D., Nemoto, T., (2010). HIV in Transgender Communities: Syndemic Dynamics and a Need for Multicomponent Interventions. *Journal of Acquired Immune Deficiency Syndrome*, 55, S91-3.

Prejean, J., Song, R., Hernandez, A., Ziebell, R., Green, T., Walker, F., Lin, L.S., An, Q.,

Mermin, J., Lansky, A., Hall, H.I., HIV Incidence Surveillance Group. (2011). Estimated HIV Incidence in the United States, 2006-2009. *PLOS ONE 6*(8), e17502.

Rasch, G. (1980). *Probabilistic models for Some Intelligence and Attainment tests.* Chicago, IL: University of Chicago Press.

Sanders-Phillips, K., (2002). Factors influencing HIV/AIDS in women of color. *Public Health Reports, 117*(S1), S151-6.

Schumacher, W.E., Frick, M., Kauselmann, V., Maier-Hoyle, R., van der Vliet, R., Babiel, R. (2007). Fully automated quantification of human immunodeficiency virus (HIV) type 1 RNA in human plasma by the COBAS AmpliPrep/COBAS Taqman system. *Journal of Clinical Virology*, 38, 304-12.

Semple, S.J., Patterson T.L., Temoshok L.R., Straits-Tröster K., Atkinson J.H., Koch W., Grant, I. (1997). Family Conflict and Depressive Symptoms: A Study of HIV-Seropositive Men. *AIDS & Behavior, 1*(1), 53-60.

Senn, T.E., Carey, M.P. (2008). HIV, STD, and Sexual Risk Reduction for Individuals with a Severe Mental Illness: Review of the Intervention Literature. *Current Psychiatry Review, 4*(2), 87-100.

Senn, T., Carey, M., Variable, P. (2010). The intersection of violence, substance use, negative affect, and STDS: Testing of a syndemic pattern among patients attending an urban STD clinic. *Journal of the National Medical Association, 102*(7), 614-20.

Singer, M. (1996). A Dose of Drugs, a Touch of Violence, a Case of AIDS: Conceptualizing the SAVA Syndemic. *Free Inquiry in Creative Sociology, 24*(2), 99-110.

Singer, M., Clair, S. (2003). Syndemics and public health: reconceptualizing disease in bio-social context. *Medical Anthropology Quarterly, 17(*4), 423-41.

Stall, R., Mills, T. C., Williamson, J., Hart, T., Greenwood, G., Paul, J., Binson, D., Osmond, D., Catania, J.A. (2003). Association of co-occurring psychosocial health problems and increased vulnerability to HIV/AIDS among urban men who have sex with men. *American Journal of Public Health, 93*(6), 939-42.

StataCorp. (2009). *Stata Statistical Software, Rel. 11.* College Station, TX: StataCorp LP.

Straus, M.A. (1979). Measuring intra family conflict and violence: The Conflict Tactics (CT) Scales. *Journal of Marriage & the Family, 41*(1), 75-88.

Tobin, K.E., Kuramoto, S.J., Davey-Rothwell, M.A., Latkin, C.A. (2011). The STEP into Action study: a peer-based, personal risk network-focused HIV prevention

intervention with injection drug users in Baltimore, Maryland. *Addiction, 106*(2), 366-75.

Towner, W.J. (2008). The Changing Face of HIV Infection. *The Permanente Journal, 12*(4), 60-4.

Wyatt, G.E. (2002). Does a history of trauma contribute to HIV risk for women of color? Implications for prevention and policy. *American Journal of Public Health*, *92*(4), 660-5.

Zea, M., Reisen, C., Poppen, P., Bianchi, F., Echeverry, J. (2005). Disclosure of HIV status and psychological well-being among Latino gay and bisexual men. *AIDS & Behavior, 9*(1), 15-26.

Zierler, S., Krieger, N. (1997). Reframing Women's Risk: Social Inequalities and HIV Infection. *Annual Review of Public Health,* 18, 401-36.

Table 5.1. Demographic characteristics of all participants (*N*=383)

Demographic Characteristic	Total *N*(%) or Mean (SD)
Race	
African-American/Black	351 (91.6)
White	27 (7.0)
Other	5 (1.4)
Education	
8th grade or less	26 (6.8)
Some high school	150 (39.2)
High school diploma/GED	145 (37.9)
Some college/tech school	45 (11.7)
College degree	10 (2.6)
Any graduate training	7 (1.8)
Monthly income	
$0-$499	87 (22.7)
$500-$999	219 (57.2)
$1000+	77 (20.1)
Relationship status	
Married	36 (9.4)
In a committed relationship	97 (25.3)
Separated	28 (7.3)
Divorced	33 (8.6)
Widowed	15 (3.9)
Single	174 (45.5)
Usual healthcare provider	
Medical clinic at a hospital	270 (70.5)
Med clinic not at a hospital	108 (28.2)
Hospital emergency room	1 (0.3)
Some other type of place	4 (1.0)
Physical functioning	
Low	135 (35.2)
Medium	116 (30.3)
High	132 (34.5)
Optimal acute care utilization	
Suboptimal	188 (49.1)
Optimal	195 (50.9)
Viral suppression	
Detectable viral load	131 (34.2)
Undetectable viral load	252 (65.8)
Ever been in jail/prison	
Yes	322 (84.1)
No	61 (15.9)
Sex	
Males	235 (61.4)
Females	148 (38.6)
Age (years)	48.2 (6.3)

Table 5.2. *SUMIC* Syndemic frequencies among African-American participants (*N*=351)

Syndemic Factor and Indicators	Total (*N*=351)
Active substance use	
Opiates in last 30 days	52 (14.8)
Marijuana in last 30 days	56 (16.0)
Heroin in last 30 days	73 (20.8)
Cocaine or crack in last 30 days	117 (33.3)
Hallucinogens in last 30 days	3 (0.9)
Prescription drugs in last 30 days	17 (4.8)
Most frequently co-occuring substances used	
Heroin/cocaine in last 30 days	63 (17.9)
Marijuana/cocaine in last 30 days	39 (11.1)
Marijuana/heroin in last 30 days	25 (7.1)
Mental illness	
Diagnosed with depression	209 (59.5)
Diagnosed with bipolar disorder	116 (33.1)
Diagnosed with anxiety or PTSD	89 (25.4)
Diagnosed with schizophrenia	34 (9.7)
Diagnosed with other psychiatric illness	18 (5.2)
Most frequently co-occuring mental illnesses	
Diagnosed with depression/bipolar disorder	109 (31.1)
Diagnosed with depression/anxiety or PTSD	81 (23.1)
Familial conflict	
Family rarely/never talks about problems	105 (29.9)
Family rarely/never problem solves together	99 (28.2)
Family rarely/never shows caring for each other	29 (8.3)
Most frequently co-occuring familial conflict	
Family rarely/never talk/problem solve together	80 (22.8)

Table 5.3. Probability of endorsing *SUMIC* Syndemic statements by latent class among African-American Indexes (*N*=351)

	C1: (43%) *Moderate SU/MI*	**C2: (25%)** *High MI*	**C3: (23%)** *Moderate SU/MI/C*	**C4: (9%)** *High SU/MI*
Active substance use				
Opiates in last 30 days	13.8***	08.1ǂ	7.3***	33.1***
Marijuana in last 30 days	14.2***	03.0	21.8***	47.9***
Heroin in last 30 days	20.6***	01.9	23.6***	71.3***
Cocaine or crack in last 30 days	33.4***	04.2	41.4***	100
Hallucinogens in last 30 days	02.1ǂ	---	---	---
Prescription drugs in last 30 days	04.0*	---	04.0ǂ	25.5**
Mental illness				
Diagnosed with depression	27.0**	92.5***	64.8***	95.2***
Diagnosed with bipolar disorder	---	68.6***	33.5***	75.6***
Diagnosed with anxiety or PTSD	03.6	43.0***	29.4***	61.2***
Diagnosed with schizophrenia	---	13.5**	09.6**	42.6***
Diagnosed with other psychiatric illness	01.9	07.6*	07.4*	06.7
Familial conflict				
Family rarely/never talks about problems	06.6**	12.4*	93.9***	25.4*
Family rarely/never problem solves together	04.3ǂ	05.9	95.9***	31.2**
Family rarely/never shows caring to each other	---	03.0	28.6***	09.7

ǂ*marginally significant p*<.10,**p*<.05, ***p*<.01, ****p*<.001

Table 5.4. Odds ratios of *SUMIC* latent class regression among African-Americans (*N*=351)[a]

	Parameter					
	Class 1: Moderate SU/MI		**Class 2: High MI**		**Class 3: Moderate *SUMIC***	
Variable	**OR[b]**	**CI[c]**	**OR[b]**	**CI[c]**	**OR[b]**	**CI[c]**
Sex *(Ref: Males)*	0.21**	(0.01, 0.61)	0.46	(0.12, 1.77)	0.21**	(0.01, 0.67)
Viral suppression *(Ref:>40 copies/mL)*	2.26	(0.73, 6.99)	4.60**	(1.48, 14.29)	4.68*	(1.26, 17.36)
Optimal acute care utilization *(Ref: 1 or more ED admissions/hospitalizations in the past 6 months)*	5.03*	(1.38, 18.39)	2.40	(0.70, 8.30)	6.56*	(1.80, 23.78)

*p<.05, **p<.01, ***p<.001 [a]Reference group: Class 4 (High SU/MI) [b]OR = Unadjusted Odds Ratio [c]CI = 95% Confidence Interval

Table 5.5. Latent class analysis fit statistics

Number of Latent Classes	Akaike Information Criteria	Bayesian Information Criteria	Entropy
2	4096.8	4220.4	0.75
3	3951.2	4144.3	0.83
4	3858.8	4121.4	0.85
5	3810.5	4142.5	0.84
6	3797.9	4199.4	0.90

Figure 5.1. Four-class latent class analysis of *SUMIC* Syndemic factors among African-Americans (*N*=351)

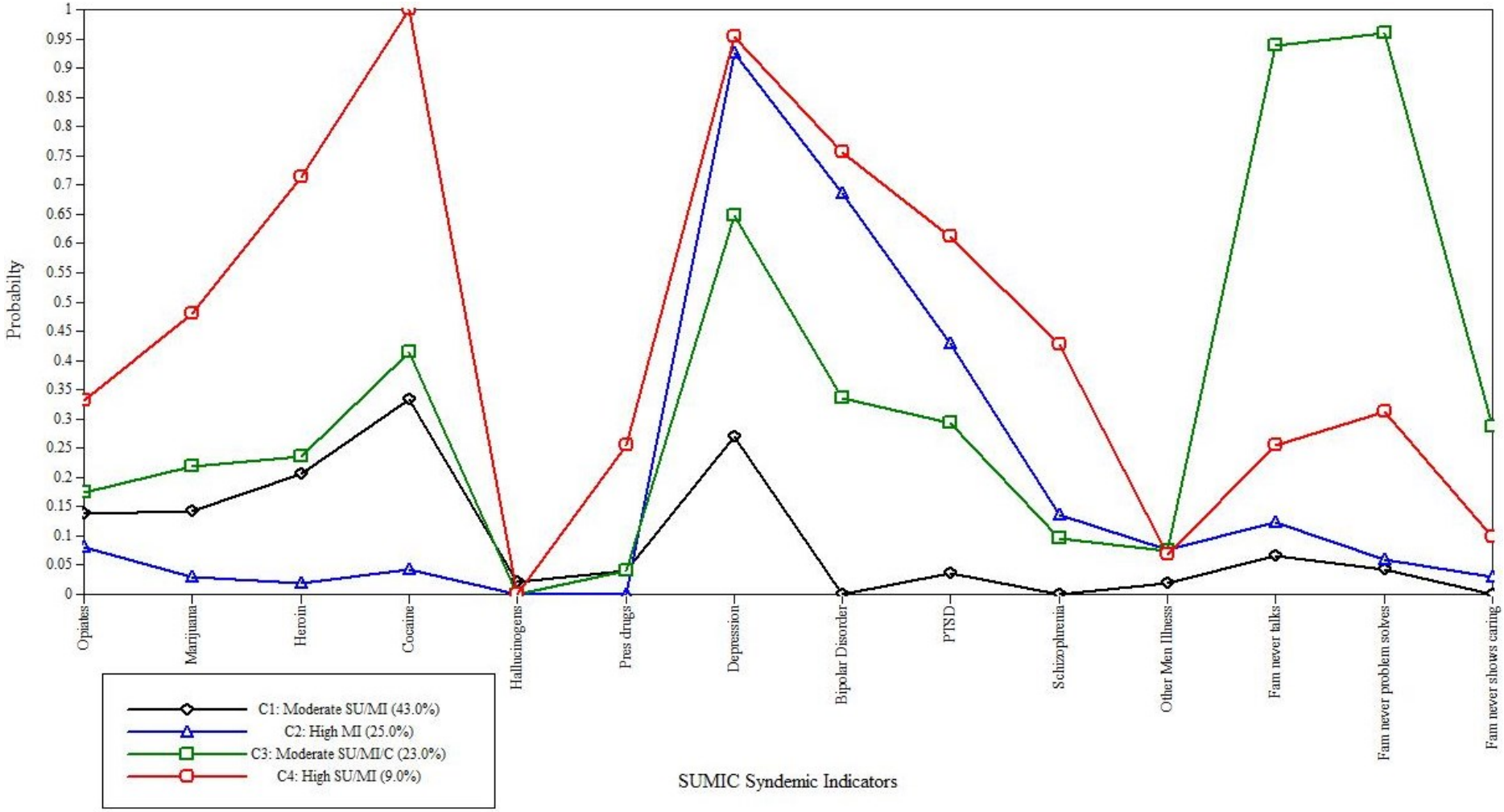


Figure 5.2. *SUMIC* Syndemic class membership as a function of sex among African-Americans (*N*=351)

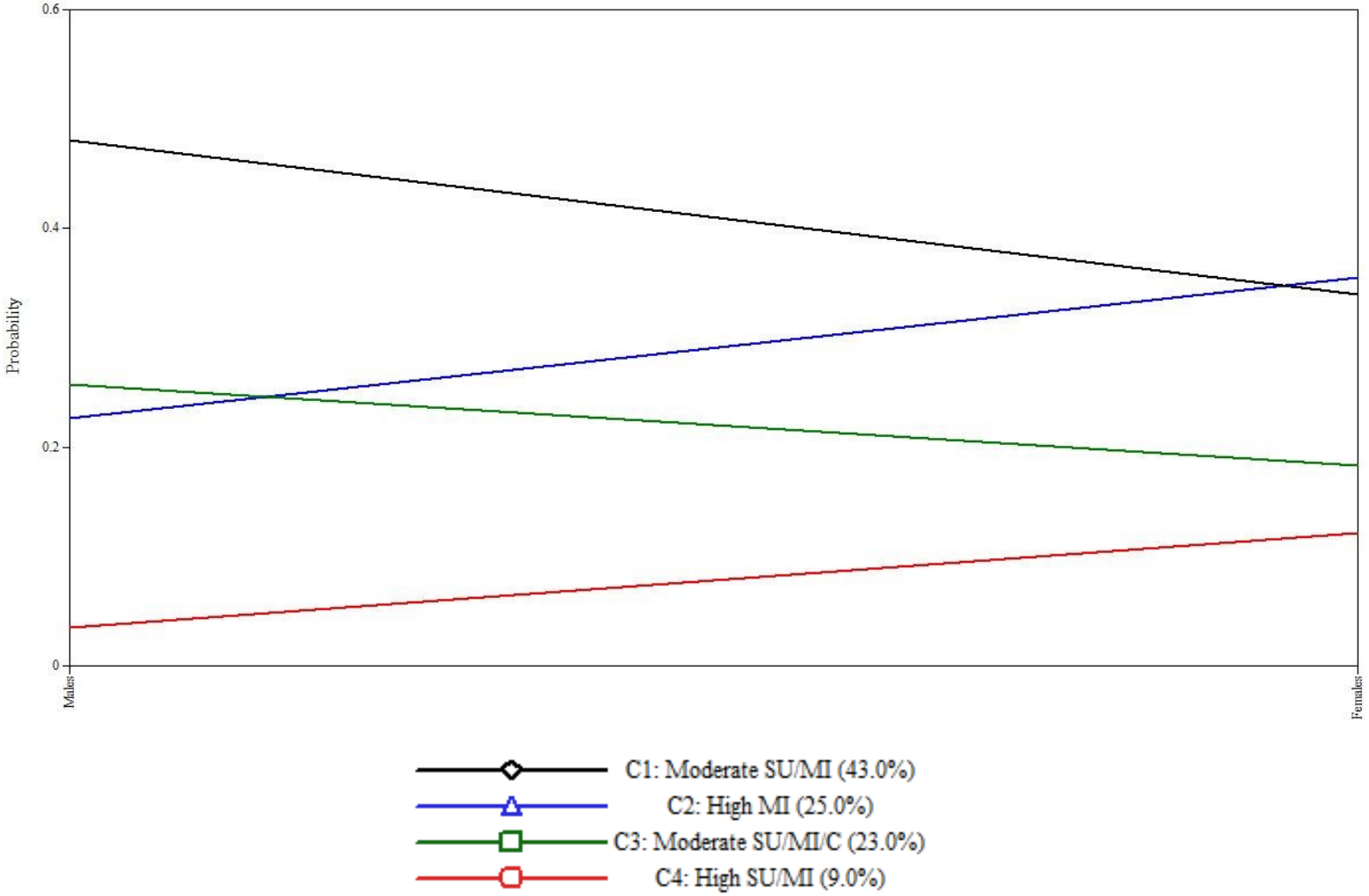


Figure 5.3. *SUMIC* Syndemic class membership as a function of viral suppression among African-Americans (*N*=351)

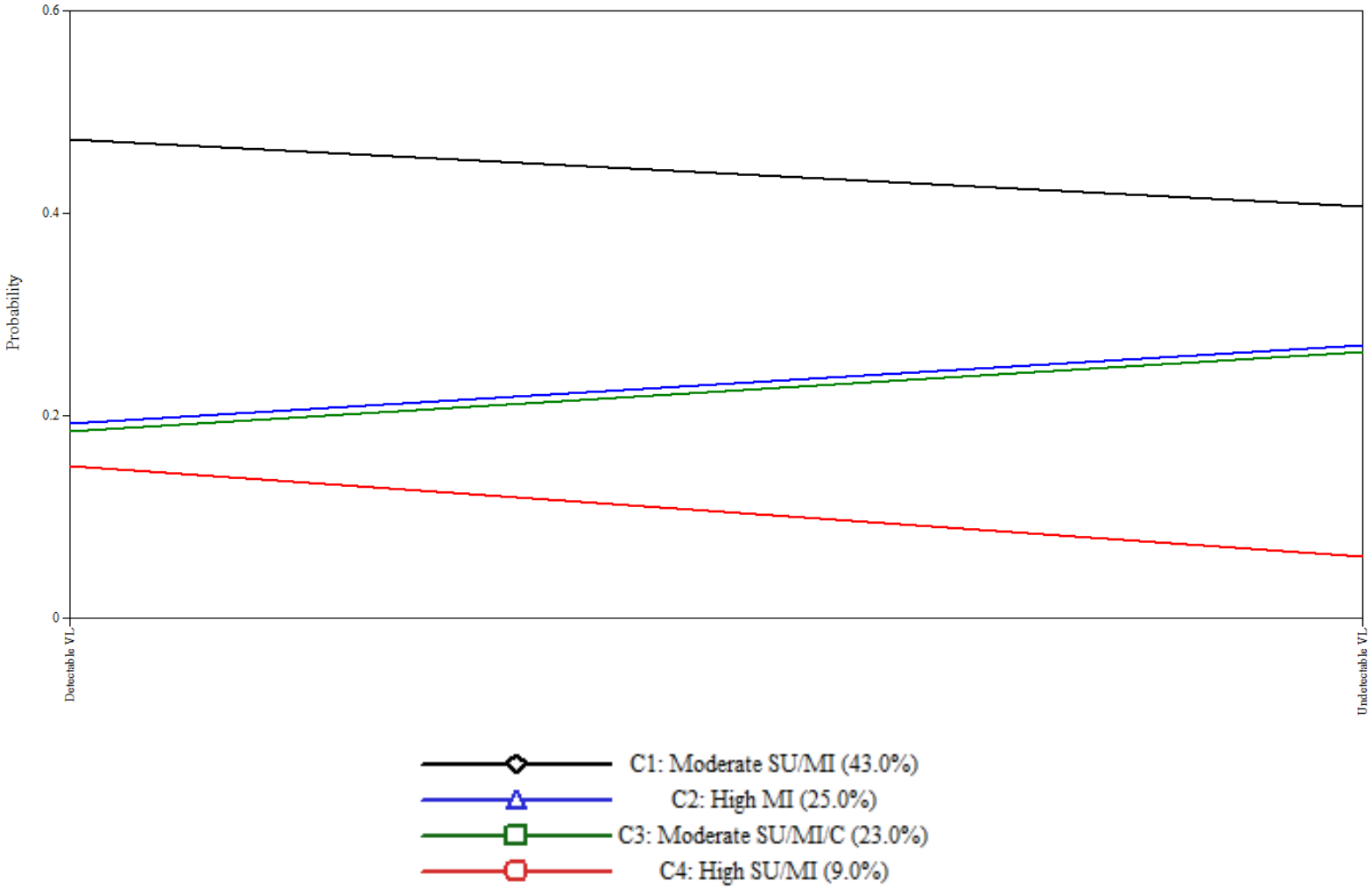
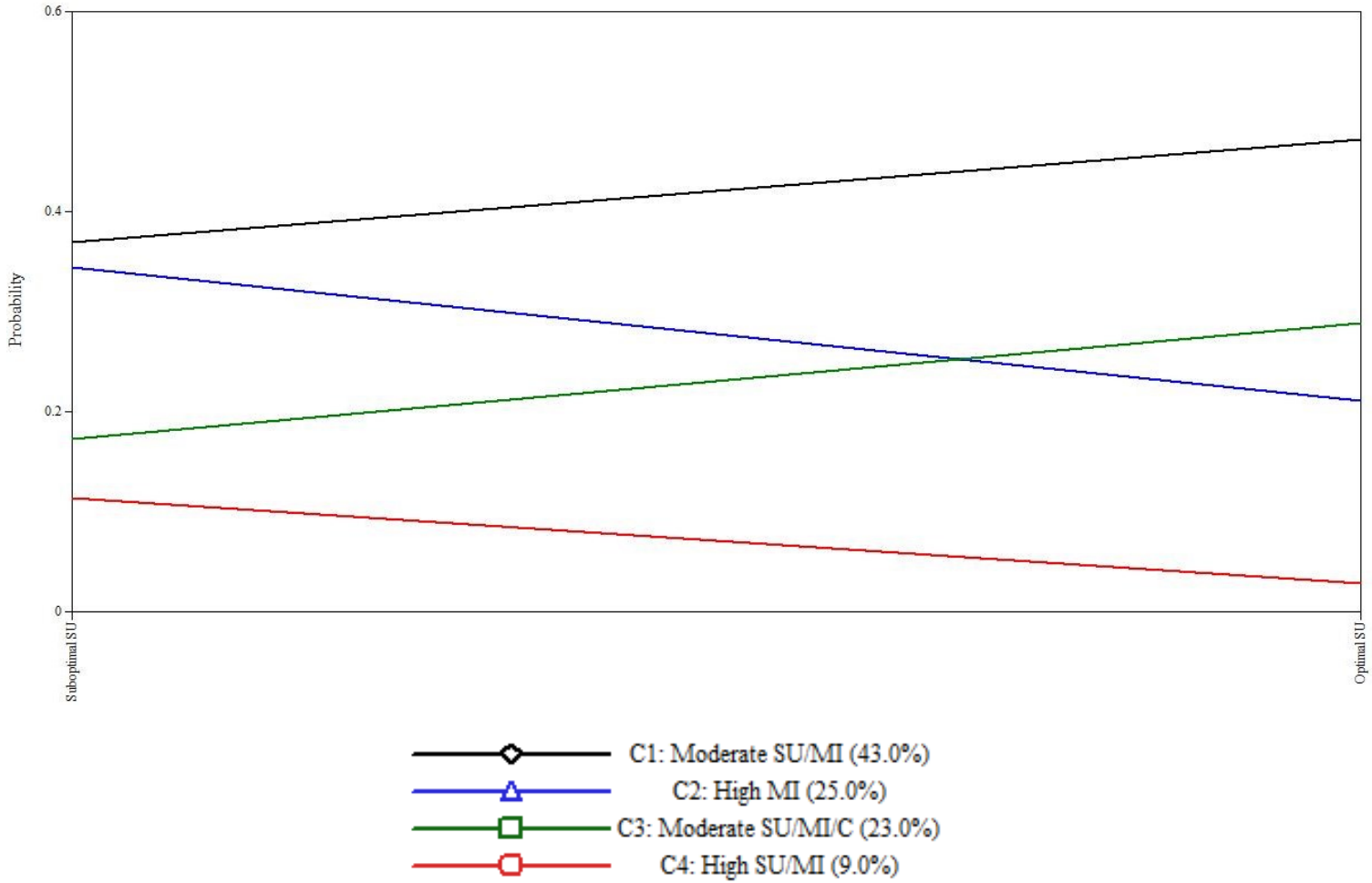


Figure 5.4. *SUMIC* Syndemic class membership as a function of acute care utilization among African-Americans (*N*=351)



CHAPTER SIX: MANUSCRIPT THREE

Psychosocial correlates of HIV medical adherence among African-American persons whom inject drugs: Implications for intervention

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ABSTRACT

Introduction: Research suggests a syndemic of substance use, mental illness, and familial conflict is associated with HIV medical non-adherence among persons living with HIV (PLHIV). Other factors, including informal care receipt, may facilitate adherence. This study explores these as correlates of HIV medical adherence, defined as undetectable viral load (UVL) and optimal acute care utilization (OAU). **Methods:** Data were from the BEACON study, which examined health outcomes among injection drug-using PLHIV. OAU was operationalized as no ER visits and/or overnight admissions in the past 6 months, and dichotomized. Latent class analyses identified syndemic classes. Poisson regression identified associations between correlates, UVL, and OAU. **Results:** Nine percent of participants had high substance use/mental illness prevalence (Class 4); 23% had moderate levels of all factors (Class 3); 25% had high mental illness (Class 2); 43% had moderate substance use/mental illness (Class 1). In adjusted analyses, *SUMIC* Syndemic Classes 3 had 1.4 times the likelihood of UVL as Class 1 (95% Confidence Interval [95% CI] = 1.15, 1.67). Individuals whose main supporter was their main partner had 35 percent higher likelihood of UVL, as compared to individuals whose main supporter was neither kin nor a main partner (Adjusted Incidence Rate Ratio [AIR] = 1.35; 95% CI = 1.05, 1.74). Individuals with frequent health-related support had nearly 30 percent lower likelihood of OAU, compared to individuals with low health-related support (AIR = 0.73; 95% CI = 0.55, 0.97). Finally, physical functioning moderated the relationship between main supporter type and OAU. **Discussion:** Results suggest that informal care receipt was not consistently associated with UVL and OAU. Conversely, higher syndemic burden may have facilitated adherence, through necessitating increased rates of healthcare engagement. Healthcare professionals should elicit discussion of social support to strengthen PLHIVs' and their supporters' relationships to improve their health.

Key words: Adherence, drug users, HIV, health disparities, Syndemic Theory, African-Americans

INTRODUCTION

Widespread availability of antiretroviral therapy has increased life expectancy of persons living with HIV (PLHIV). Despite these advancements, only twenty-eight percent of PLHIV are aware of their status, on antiretroviral therapy (ART), and managing their illness (CDC, 2010). A clinical trial of ART adherence found patients enrolled in hospitals were seventy to eighty percent adherent (Mannheimer, Friedland, Matts, Child, & Chesney, 2002). Among those with mental illness, and/or racial/ethnic minorities, rates were approximately sixty-five percent under managed hospital care (Wolf et al., 2007; Mannheimer et al., 2002). Adherence rates have been estimated as fifty to sixty percent among persons who inject drugs (PWID; Wolf et al., 2007). Therefore, disparities in HIV health outcomes place racial and gender minorities at risk of non-adherence. A related controversy, however, is measurement of adherence itself.

A new framework of adherence

ART adherence refers to medication adherence, defined as conformity to provider recommendations about day-to-day treatment with respect to timing, dosage, and frequency of prescriptions (Cramer et al., 2008). Much of the HIV literature addresses medication adherence, utilizing viral suppression as primary data. However, viral suppression is an outcome of medication adherence, not a direct measure of medication adherence. Conversely, therapeutic adherence refers to how much global health behaviors (i.e., taking medication, getting health screenings, eating healthily, and attending follow-up appointments) coincide with the recommendations by his/her health care provider (Jin, Sklar, Min Sen Oh, & Li, 2008). Therapeutic adherence globally refers to a PLHIV's maintenance of behaviors such as accessing HIV primary care, healthy lifestyle choices,

including abstaining substance use abstinence (Mannheimer et al., 2002; Chesney, 2006). Thus, therapeutic adherence includes medication adherence, yet the latter does not include the former. Therefore, operationalization of adherence is contingent upon factors such as patient literacy and resource constraints (Chesney, 2006).

In consideration of these issues, this study advocates the term "HIV medical adherence", (e.g. viral suppression and optimal acute care utilization). Viral suppression, defined as an HIV viral load of 40 copies per milliliter or less (Schumacher et al., 2007), is a biomarker outcome of medication adherence (Chesney, 2006; Mannheimer et al., 2002; Howard et al., 2002; Paterson et al., 2000; DiMatteo, Giordani, Lepper, & Croghan, 2002). The HIV Cost and Service Utilization Study defines optimal services utilization as prompt engagement in HIV care after diagnosis, minimization of emergency room visits and inpatient care, and successful management of HIV illness through use of ART (Fremont et al., 2007). The present study recruited individuals who were nearly all insured and enrolled in care, therefore the outcome of interest in optimal acute care utilization, rather than healthcare utilization in general. Thus, "HIV medical adherence" is inclusive of medication and therapeutic adherence, both of which are contextualized to this research population.

HIV medical adherence - personal factors

While few factors have consistently predicted HIV medical adherence, individual and socio-contextual correlates of adherence have been identified (Barclay et al., 2007). Individual factors refer to personal vulnerability to HIV medical non-adherence, such as lack of knowledge and skills required to protect oneself (Joint United Nations Programme on HIV/AIDS [UNAIDS], 1998). For example, Levy (1998) showed that HIV incidence

among middle-aged and older adults is growing. Other studies, conversely, have demonstrated that older age is predictive of ART adherence (Barclay et al., 2007). Therefore, what may be more indicative of adherence is time since HIV diagnoses, rather than age itself. Similarly, physical health status has been correlated, albeit with conflicting results, to ART adherence.

Previous literature in quality of life (QoL) among PLHIV defines this construct as inclusive of physical health (Imam, Karim, Ferdous, & Akhter, 2011; Ryff et al., 2006; Ware et al., 1995). Physical limitations, or poor physical health status limiting one's ability to care for themselves independently, are generally associated with poor adherence outcomes among PLHIV and lower QoL (Rai, Dutta, & Gulati, 2010; Cunningham, Crystal, Bozzette, & Hays, 2005). Mental health is also a dimension of QoL. Blashill et al (2013) found that low physical activity predicted more mental illness and less ART adherence. However, De Socio, Fanelli, Longo, and Stagni (2004) showed that patients diagnosed with bipolar disorder, in care and on ART, had over 90 percent ART adherence.

Investigations of co-morbidities among PLHIV suggest that mental illness is a mutually reinforcing risk and consequence of HIV infection. Moreover, Singer (1996) proposed a syndemic of substance abuse, intimate partner violence, HIV risk, and depression among low-income urban women. A syndemic refers to co-morbid conditions, which interact synergistically and increase disease burden (Singer, 1996; Singer & Clair, 2003). Subsequent studies have shown substance use and mental illness as syndemic factors among PLHIV which, combined with racial disparities in HIV, place African-American PLHIV at risk of decreased QoL and non-adherence (CDC, 2012).

HIV medical adherence - socio-contextual factors

Socio-context refers to cultural norms, practices, and/or laws that disempower, and impede positive HIV health outcomes (UNAIDS, 1998). African-American PLHIV, particularly if PWID, have lower ART adherence compared to Whites and/or non-substance users, (CDC, 2010; Reynolds et al., 2004). African-American women have higher risk of HIV due to having male partners who have sex with men (Hall, An, Hutchinson, & Sansom, 2008; Melkote, Muppidi, & Goswami, 2000; CDC, 2010). Pervasive stigma of homosexuality leads many African-American men to maintain heterosexual relationships, yet unlikely to use condoms during sex, thus potentially infecting both African-American male and female partners (Melkote et al., 2000; Buseh & Stevens, 2008).

Perceived HIV-related stigma is ubiquitous and impedes adherence among PLHIV (Jeffries, Marks, Lauby, Murrill, & Millett, 2013; Galvan, Davis, Banks, & Bing, 2008). HIV stigma results from moral judgments of PLHIV, and stereotypes of how HIV is transmitted (Jeffries et al., 2013; Galvan et al., 2008). Stigma may reduce PLHIV's access to social support, which is purported to increase adherence (Galvan et al., 2008). Research among African-American PWID PLHIV suggests health-related support, or informal care provided by family or friends, facilitates adherence (Knowlton & Latkin, 2007; Kalichman, Cherry, & Brown, 1999; Edwards, 2006). However, more research is needed to differentiate the effects of various social support dimensions on adherence.

Purpose

The objective of present study was to identify psychosocial correlates of HIV

medical adherence among African-American PLHIV. Specifically, we sought to: (a) identify individual and socio-contextual correlates of HIV medical adherence; and (b) assess the effects of social support on HIV medical adherence. This study builds upon extant literature and simultaneously examined both individual and socio-contexual correlates of adherence, with implications for interventions among PWID PLHIV.

METHODS

Procedure

Data were from baseline of the BEACON study, which examined psychosocial health outcomes among PLHIV. A total of 383 participants completed baseline surveys (267 current PWID, 116 former PWID). Inclusion criteria were: (a) age of 18 years or older; (b) HIV seropositivity; (c) injection drug use; (d) use of ART in the prior 30 days; and (e) willingness to recruit main supporter(s) to the study. Participants were recruited via an HIV clinic and street outreach. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved all study activities.

Measures

Dependent variables

HIV medical adherence was defined as viral suppression and optimal acute care utilization. Viral suppression was measured as $\leq$40 copies per mL, by the Roche Cobas Amplicor (Schumacher et al., 2007), where 0 = detectable viral load, and 1 = undetectable viral load (UVL). Optimal acute care utilization (OAU), was measured by "In the past 6 months, how many times have you gone to an emergency room (ER) for your health care?", and "In the past 6 months, how many times were you admitted to a hospital, that means that you stayed there overnight?" Responses were summed and

dichotomized, where 0 = 1 or more ER visits and/or hospitalizations in the last 6 months, and 1 = none (Fremont et al., 2007; MacCallum, Zhang, Preacher, & Rucker, 2002).

Independent variables

Predictor variables included individual factors (*SUMIC* Syndemic class, physical functioning, age, sex, education) and socio-contextual factors (HIV stigma, negative social exchange, main supporter relationship, ART-related support, health-related support). Latent class analyses (LCA) categorized individuals along the spectrum of a latent *SUMIC* Syndemic (identified by participants' substance use (*SU*), mental illness (*MI*), and familial conflict (*C*; Collins & Lanza, 2010). Substance use was defined as use of opiates, marijuana, heroin, cocaine or crack, hallucinogens, and/or prescription drugs, where 0 = no substance use, 1 = active use in the past 30 days. Mental illness was coded as having ever been diagnosed by a doctor with depression, bipolar disorder, anxiety or post-traumatic stress disorder (PTSD), schizophrenia, and/or any other psychiatric condition, where 0 = not diagnosed, and 1 = diagnosed. Familial conflict was coded as family members rarely discussing problems, problem-solving together, or show caring for one another, where 0 = no, and 1 = yes (Straus, 1979; Table 6.2). In regression analyses, a 4-level categorical variable represented syndemic class.

Physical functioning was assessed by the Medical Outcomes Study Physical Functioning Measure (McDowell & Newell, 1996). Items included "How much does your health affect your ability to bend, lift, or squat down?" Responses were reverse scored, and trichotomized, where 0 = low physical functioning, 1 = moderate physical functioning, and 2 = high physical functioning (Fong, 2014). Age was dichotomized at the median, where 0 = less than 49 years, and 1 = age 49 years and older (MacCallum et

al., 2002). Educational attainment was assessed by, "What is the highest level of education you've had?" Responses were collapsed, where 0 = 8th grade or less, 1 = some high school, 2 = high school diploma or GED, 3 = some college or above. Sex was assessed by a single item, and coded 1 = males, and 2 = females.

HIV stigma was assessed via a scale by Wight et al (2006), including, "Thinking about having HIV, how much do you feel that you need to hide it?", Responses were on a 4-point Likert scale, ranging from "Not at all" to "Very much". Responses was trichotomized, where 0 = low stigma, 1 = medium stigma, and 2 = high stigma (Fong, 2014). Negative social exchange was measured by items including, "In the past 30 days, how often did you feel that someone you know was not paying enough attention to you?" Participants' responses were on a 3-point Likert scale, ranging from "None of the time" to "All of the time" (Newsom, Nishishiba, Morgan, Rook, & 2003). Responses were trichotomized, where 0 = low negative exchange, and 1 = moderate negative exchange, and 2 = frequent negative exchange (Fong, 2014). Main supporter relationship was coded as 0 = other relationship/or no main supporter, 1 = main partner, and 2 = kin.

ART-related support was assessed by, "How often does your main supporter talk to you about your HIV medications or side effects?" (Barrera, Jr. & Gottlieb, 1981). Responses were on a 4-point Likert scale, from "Never" to "Very often". Responses were trichotomized, where 0 = low ART-related support, 1 = moderate ART-related support, and 2 = high ART-related support (Fong, 2014). Health-related support was assessed with items from the Arizona Social Support Inventory (Barrera, Jr. & Gottlieb, 1981), including "In the last year, has anyone gone with you to a doctor's appointment or to the

ER to get medical care?" Responses were dichotomized at the median, where 0 = low health-related support, and 1 = high health-related support (MacCallum et al., 2002).

Data analyses

Univariate frequencies were generated for all variables on the total sample (*N*=383). Bivariate analyses were conducted between the outcome and predictors to determine which factors would remain in multivariate analyses. Marginally-significant variables ($p<.10$; Gordon, 2012), were entered into a Poisson regression model invoking robust standard errors. Poisson regression is appropriate for binary outcome data, for non-rare outcomes (McNutt, Wu, Xue, & Hafner, 2003). Robust standard errors accounted for heteroskedasticity (inconstant variation; Long, 1997). Regression analyses were restricted to African-Americans, due to lack of race variation among participants (*N*=351). Post-hoc analyses tested for interactions. Analyses were conducted on complete cases (less than 10% missing; Bennett, 2001), in STATA Version 11.2 SE (StataCorp, 2009).

RESULTS

Descriptive statistics

Participants were predominantly African-American (91.6%), and male (61.4%); mean age was 48.2 years (*N*=383; Table 6.1). Nearly half of participants reported high rates of HIV stigma (45.7%), and a kin main supporter (45.2%). Table 6.2 reports LCA of *SUMIC* Syndemic latent classes among African-Americans (*N*=351). Forty-three percent of participants had moderate substance use/mental illness (Class 1), 25% had high mental illness (Class 2), 23% had moderate levels of all factors (Class 3), and 9% had high substance use/mental illness prevalence (Class 4).

Poisson regression results: Correlates of UVL

In adjusted analyses, *SUMIC* Syndemic Classes 3 individuals had 1.4 times the likelihood of UVL as Class 1 (95% Confidence Interval [95% CI] = 1.15, 1.67; Table 6.3). Individuals with high physical function had 20% higher likelihood of UVL, as those with low physical function (Adjusted Incidence Rate Ratio [AIR] = 1.23; 95% CI = 1.01, 1.51). Individuals whose main supporter was their main partner had 35% higher likelihood of UVL, as individuals whose main supporter was neither family nor a main supporter (AIR = 1.35; 95% CI = 1.05, 1.74).

Poisson regression results: Correlates of OAU

Mode1 1 in Table 6.4 reports main effects of adjusted analyses. Individuals in Classes 2 and 4 had between 30% to 70% lower likelihood of OAU as Class 1 (*N*=331). Individuals with frequent ART-related support had 26% lower likelihood of OAU, than individuals reporting rare ART-related support (AIR = 0.74; 95% CI = 0.57, 0.95). Individuals with frequent health-related support had 30% lower likelihood of OAU, compared to individuals with low health-related support (AIR = 0 .73; 95% CI = 0.55, 0.97).

Post-hoc analyses

Analyses revealed that physical functioning moderated the relationship between main supporter role relation and OAU (Table 6.4). A parameter test of the interaction term was marginally-significant (Chi-square statistic [χ^2] = 9.00; *p*=.06; Ai & Norton, 2003). Model 2 reports a categorical variable, denoting each of the nine combinations of the variables (e.g., 1 = low physical functioning and main supporter is non-kin and non-

partner). Thus, main and interactive effects are easily interpretable and account for differing interactive effects by level (Gaskin et al., 2013). Compared to those with low physical functioning, individuals with high physical functioning and Non-kin/non-partner/Other main supporter had 2.5 times the likelihood of optimal acute care utilization (AIR = 2.49; 95% CI = 1.19, 5.19). Figure 6.1 depicts marginal effects of OAU and the interaction of main supporter type and physical functioning among African-Americans (*N*=331), holding all other covariates at their means (StataCorp, 2009). Probability of OAU was highest for individuals with high physical functioning and an "Other" supporter, and lowest for those with low physical functioning and an "Other" supporter (0.67 vs. 0.27).

DISCUSSION

The purpose of the present study was to assess HIV medical adherence among African-American PLHIV. Findings suggest that individual and socio-contextual factors function uniquely in their associations with HIV medical adherence. This is congruent with the HIV literature, as PLHIV have complex personal and interpersonal characteristics impacting their health. Mechanisms which explain these relationships, however, differ by outcome (Tables 6.3 and 6.4). Results indicated that, surprisingly, individuals with moderate *SUMIC* Syndemic burden (Class 3) had 1.4 times the likelihood of UVL as individuals with low burden (Class 1). It is possible that higher rates of concurrent substance use, mental illness requires more engagement in healthcare, thereby promoting ART adherence. Given that the main difference between the classes was higher presence of familial conflict in Class 3, future research should explore factors associated with familial conflict, healthcare engagement, and adherence.

Highly physically functioning individuals had twenty percent higher likelihood of UVL as low functioning individuals, which is consistent with previous research among PLHIV (Cunningham et al., 2005). Higher education was also predictive of UVL; thus, healthcare providers should address educational and/or literacy factors among African-American PLHIV (Osborn, Paasche-Orlow, Davis, & Wolf, 2007). Individuals with kin or main partner supporters had higher likelihood of UVL, suggesting that informal caregivers are critical to engage in health interventions (Mosack & Petroll, 2009).

Correlates of OAU included physical functioning, main supporter relationship, and *SUMIC* Syndemic class. Contrary to UVL, and as expected, higher *SUMIC* Syndemic burden predicted lower likelihood of OAU, which is consistent with previous HIV syndemic and health services research (Meyer, Springer, & Altice, 2011). Other novel findings include that a higher level of health-related support was associated with thirty percent lower likelihood of OAU. It is possible health-related support is being provided to PLHIV, without clear communication about expectations with main supporters, particularly if these Indexes are also in worse physical health.

Post-hoc analyses revealed physical functioning moderated the relationship between main supporter type and optimal acute care utilization (Table 6.4 and Figure 6.1). Research suggests that highly physically-functional individuals should have had the highest OAU, yet this was only true for individuals with non-kin and non-partner supporters. For all other levels of physical functioning, however, having a kin or partner supporter was promoted optimal acute care use. Thus, this finding suggests that a complicated relationship exists when partners or kin are main supporters. It is plausible that these individuals may worry more about participants, and show caring by encouraging their use of acute care services more than other caregivers.

Limitations

This study has several limitations. First, data were cross-sectional, which prevents assessment of temporal fluctuations in the variables of interest. Second, other correlates may have merited inclusion in statistical models, such as adherence to medications to treat mental illnesses, which were highly prevalent among this sample. Third, participants were African-American PWID, in medical care, and on ART. While this population is underrepresented in research, it is unclear if similar findings exist for other race/ethnic groups, or African Americans who live in suburban and rural areas.

Next, while the use of optimal acute care utilization builds on the prior HCSUS study definition (Fremont et al., 2007), reasons for acute care utilization in the sample were unknown and therefore use may not be suboptimal. Finally, the marginal significance of the Main supporter **X** Physical function interaction on OAU may be because interaction terms are less powered than main effects. While the term was retained for theoretical meaning (Greenland, 1993), future research should investigate this with a larger sample.

Nonetheless, the present study has also several strengths to its credit. As stated, this study examined both individual and socio-contexual correlates of adherence. Similarly, one of the individual-level predictors (Syndemic class), is the result of an empirical latent class analyses which is only the second of its kind to associate syndemic class and adverse adherence outcomes (Blashill et al., 2014). Next, the outcome of interest, medical adherence, comprises a nuanced and contextualized definition of medication adherence (e.g. viral suppression), and therapeutic adherence (e.g. optimal acute care utilization). Finally, this study is one of few to examine adherence outcomes among low-income, drug-using, African-Americans.

Conclusions

The present study lends support to the importance of examining syndemic factors as predictive of adherence outcomes. Additionally, study findings suggest that social support is not clearly protective among African-American PLHIV. Next, medication and therapeutic adherence outcomes have unique relationship between syndemic and social support factors. Future training with healthcare providers in structural competence should conceptualize individual and socio-contextual factors within the healthcare context, potentially improving adherence and other health outcomes among PLHIV (Metzl & Hansen, 2014). Next, results suggest that even among individuals enrolled in HIV primary care and on ART, use of emergency health care was high (49%). Moreover, individual factors such as active substance use, age, and mental illness were more highly associated with UVL, than socio-contextual factors such as HIV stigma and negative social exchange. The surprising relationship between health-related support and OAU, and interaction between main supporter and physical functioning on OAU, suggest that socio-contextual factors may be important for OAU. This is fitting, as OAU may require PLHIV to access their informal care networks. This may also explain why higher *SUMIC* Syndemic burden predicted higher UVL and lower OAU.

Finally, this study is unique in proposing and testing a congruent model to compare two adherence outcomes. The differing effects of *SUMIC* Syndemic class on medication (UVL) versus therapeutic adherence (OAU) should be addressed by future studies, to clarify the role of these factors in HIV outcomes. Findings lend support to assessing adherence dimensions to improve health outcomes among African-American PLHIV. Finally, the importance of mental and physical health in HIV medical adherence merit further research to improve quality of life in this population.

REFERENCES

Ai, C., Norton, E.C. (2003). Interaction Terms in Logit and Probit Models. *Economics Letters, 80*(1), 123-9.

Barclay, T.R., Hinkin, C.H., Castellon, S.A., Mason, K.I., Reinhard, M.J., Marion, S.D., Levine, A.J., Durvasula, R.S. (2007). Age-associated predictors of medication adherence in HIV-positive adults: health beliefs, self-efficacy, and neurocognitive status. *Health Psychology,* 26, 40-9.

Barrera Jr., M.A. Gottlieb, B.H. (1981). *Social Support in the adjustment of pregnant adolescents: Assessment issues*. In B.H. Gottlieb (Ed.). Social networks and social support, 69-96.

Bennett, D.A. (2001). How can I deal with missing data in my study? *Australian and New Zealand Journal of Public Health*, 25, 464-9.

Blashill, A.J., Mayer, K.H., Crane, H., Magidson, J.F., Grasso, C., Mathews, W.C., Saag, M.S., Safren, S.A. (2013). Physical activity and health outcomes among HIV-infected men who have sex with men: a longitudinal mediational analysis. *Annals of Behavioral Medicine, 46*(2), 149-56.

Blashill, A.J., Bedoya, C.A., Mayer, K.H., O'Cleirigh, C., Pinkston, M.M., Remmert, J.E., Mimiaga, M.J., Safren, S.A. (2014). Psychosocial Syndemics are Additively Associated with Worse ART Adherence in HIV-Infected Individuals. *AIDS & Behavior*, (Epub), doi: 10.1007/s10461-014-0925-6.

Buseh, A.G, Stevens, P.E. (2008). Constrained But Not Determined by Stigma: Resistance by African-American Women Living with HIV. *Women & Health, 44*(3), 1-18.

Centers for Disease Control and Prevention [CDC] (2010). HIV/AIDS and women: For the public. *Retrieved August 1, 2014 from* http://www.cdc.gov/hiv/topics/women/index.htm.

Chesney, M.A. (2006). The elusive gold standard. Future perspectives for HIV adherence assessment and intervention. *Journal of Acquired Immune Deficiency Syndrome, 43*(S1), S149-55.

Collins, L.M., Lanza, S.T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences*. New York, NY: Wiley Publishing.

Cramer, J.A., Roy, A., Burrell, A., Fairchild, C.J., Fuldeore, M.J., Ollendorf, D.A., Wong, P.K. (2008). Medication Compliance and Persistence: Terminology and Definitions. *Value in Health*, 11, 44-7.

Cunningham, W.E., Crystal, S., Bozzette, S., Hays, R.D. (2005). The Association of

Health-related Quality of Life with Survival Among Persons with HIV Infection in the United States. *Journal of General Internal Medicine*, 21-7.

De Socio, G.V.L., Fanelli, L., Longo, A., Stagni, G. (2004). Adherence to Antiretroviral Therapy in HIV Patients With Psychiatric Comorbidity. *Journal of Acquired Immune Deficiency Syndromes, 36*(5), 1109-10.

DiMatteo, M.R., Giordani, P.J., Lepper, H.S., Croghan, T.W. (2002). Patient adherence and medical treatment outcomes: a meta-analysis. *Medical Care, 40*(9), 794-811.

Edwards, L.V. (2006). Perceived Social Support and HIV/AIDS Medication Adherence Among African-American Women. *Qualitative Health Research*, 16, 679-91.

Fong, Y. (2014). R Statistical Software – Chngpt package for change point logistic regression. *Retrieved September 7, 2014 from* http://www.cran.r-project.org/web/packages/chngpt/chngpt.pdf.

Fremont, A., Young, A., Chinman, M., Pantoja, P., Morton, S.C., Koegel, P., Sullivan, J.G., Kanouse, D.E. (2007). Differences in HIV Care Between Patients with and Without Severe Mental Illness. *Psychiatric Services, 58*(5), 681-8.

Galvan, F.H., Davis, E.M., Banks, D., Bing, E.G. (2008). HIV stigma and social support among African Americans. *AIDS Patient Care & STDS*, 22, 423-36.

Gaskin, D.J., Thorpe. R.J. Jr, McGinty, E.E., Bower, K., Rohde, C., Young, J.H., LaVeist, T.A., Dubay, L. (2013). Disparities in Diabetes: The Nexus of Race, Poverty, and Place. *American Journal of Public Health,* doi: 10.2105/AJPH.2013.301420.

Gordon, R.A. (2012). *Applied Statistics for the Social and Health Sciences.* New York, NY: Routledge.

Greenland, S. (1993). Basic Problems in Interaction Assessment. *Environmental Health Perspectives, 101*(S4), 59-66.

Hall, I., An, Q., Hutchinson, A., Sansom, S. (2008). Estimating the Lifetime Risk of a Diagnosis of the HIV Infection in 33 States, 2004–2005. *JAIDS, 49*(3), 294-97.

Howard, A.A., Arnsten, J.H., Lo, Y., Vlahov, D., Rich, J.D., Schuman, P., Stone, V.E., Smith, D.K., Schoenbaum, E.E., HER Study Group. (2002). A prospective study of adherence and viral load in a large multi-center cohort of HIV-infected women. *AIDS, 16*(16), 2175-82.

Imam, M.H., Karim, M.R., Ferdous, C., Akhter, S. (2011). Health related quality of life among the people living with HIV. *Bangladesh Medical Research Council Bulletin, 37*(1), 1-6.

Jeffries IV, W.L., Marks, G., Lauby, J., Murrill, C.S., Millett, G.A. (2013). Homophobia is associated with sexual behavior that increases risk of acquiring and transmitting

HIV infection among black men who have sex with men. *AIDS & Behavior, 17*(4), 1442-53.

Jin, J., Sklar, G.E., Min Sen Oh, V.M., Li, S.C. (2008). Factors affecting therapeutic compliance: A review from the patient's perspective. *Therapeutics & Clinical Risk Management, 4*(1), 269–86.

Joint United Nations Programme on HIV/AIDS (1998). Expanding the global response to HIV/AIDS through focused action: Reducing risk and vulnerability: definitions, rationale and pathways. Geneva, UNAIDS.

Kalichman, S.C., Cherry, C., Brown, F. (1999). Effectiveness of a video-based motivational skills-building HIV risk-reduction intervention for inner-city African American men. *Journal of Consulting & Clinical Psychology*, 67, 959-66.

Knowlton, A.R., Latkin, C.A. (2007). Network financial support and conflict as predictors of depressive symptoms among a highly disadvantaged population. *Journal of Community Psychology, 35*(1), 13-28.

Levy, J.A. (1998). HIV/AIDS and injecting drug use in later life. *Research & Aging*, 20, 776-97.

Long, J.S. (1997). *Regression Models for Categorical and Limited Dependent Variables – Advanced Quantitative Techniques in the Social Sciences.* (1st ed). Thousand Oaks, CA: Sage Publications.

MacCallum, R.C., Zhang, S., Preacher, K.J., Rucker, D.D. (2002). On the Practice of Dichotomization of Quantitative Variables. *Psychological Methods, 7*(1), 19-40.

Mannheimer, S., Friedland, G., Matts, J., Child, C., Chesney, M. (2002). The consistency of adherence to antiretroviral therapy predicts biologic outcomes for human immunodeficiency virus-infected persons in clinical trials. *Clinical & Infectious Diseases, 34*(8), 1115-21.

McDowell, I., Newell, C. (1996). *Measuring Health.* (2nd ed.). New York, NY: Oxford.

McNutt, L.A., Wu, C., Xue, X., Hafner, J.P. (2003). Estimating the Relative Risk in Cohort Studies and Clinical Trials of Common Outcomes. *American Journal of Epidemiology, 157*(10), 940-3.

Melkote, S.R., Muppidi, S.R., Goswami, D. (2000). Social and economic factors in an integrated behavioral and societal approach to communications in HIV/AIDS. *Journal of Health Communications*, 5, 17-27.

Metzl, J.M., Hansen, H. (2014). Structural competency: Theorizing a new medical engagement with stigma and inequality. *Social Science & Medicine*, 103, 126-33.

Meyer, J.P., Springer, S.A., Altice, F.L. (2011). Substance abuse, violence, and HIV in women: a literature review of the syndemic. *Journal of Women's Health, 20*(7), 991-1006.

Mosack, K.E., Petroll, A., (2009). Patients' Perspectives on Informal Caregiver Involvement in HIV Health Care Appointments. *AIDS Patient Care& STDS, 23*(12), 1043-51.

Newsom, J.T., Nishishiba, M., Morgan, D.L., Rook, K.S. (2003). The relative importance of three domains of positive and negative social exchanges: A longitudinal model with comparable measures. *Psychology & Aging*, 18,746-54.

Osborn, C.Y., Paasche-Orlow, M.K., Davis, T.C., Wolf, M.S. (2007). Health literacy: an overlooked factor in understanding HIV health disparities. *American Journal of Preventive Medicine,* 33, 374-8.

Paterson, D.L., Swindells, S., Mohr, J., Brester, M., Vergis, E.N., Squier, C., Wagener, M.M., Singh, N. (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Annals of Internal Medicine, 133*(1), 21-30.

Rai, Y., Dutta, T., Gulati, A.K. (2010). Quality of life of HIV-infected people across different stages of infection. *Journal of Happiness Studies, 11*(1), 61-9.

Reynolds, N.R., Testa, M.A., Marc, L.G., Chesney, M.A., Neidig, J.L., Smith, S.R., Vella, S., Robbins, G.K. (2004). Factors influencing medication adherence beliefs and self-efficacy in persons naive to antiretroviral therapy: a multicenter, cross-sectional study. *AIDS & Behavior, 8*(2), 141-50.

Ryff, C.D., Love, G.D., Urry, L.H., Muller, D., Rosenkranz, M.A., Friedman, E.M., Davidson, R.J., Singer, B. (2006). Psychological well-being and ill-being: do they have distinct or mirrored biological correlates? *Psychotherapy & Psychosomatics,* 75, 85-95.

Schumacher, W.E. Frick, M. Kauselmann, V. Maier-Hoyle, R. van der Vliet, R., Babiel, R. (2007). Fully automated quantification of human immunodeficiency virus (HIV) type 1 RNA in human plasma by the COBAS AmpliPrep/COBAS Taqman system. *Journal of Clinical Virology*, 38, 304-12.

Shapiro, M.F., Morton,S.C., McCaffrey, D.F., Senterfitt, J.W., Fleishman, J.A., Perlman, J.F., Athey,L.A., Keesey, J.W., Goldman, D.P., Berry, S.H., Bozzette, S.A. (1999). Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. *JAMA, 281*(24), 2305-15.

Singer, M. (1996). A Dose of Drugs, a Touch of Violence, a Case of AIDS: Conceptualizing the SAVA Syndemic. *Free Inquiry in Creative Sociology, 24*(2), 99-110.

Singer, M., Clair, S. (2003). Syndemics and public health: reconceptualizing disease in

bio-social context. *Medical Anthropology Quarterly, 17(*4), 423-41.

StataCorp (2009). *Stata 11 Base Reference Manual.* College Station, TX: Stata Press.

StataCorp (2009). *Stata Statistical Software: Rel. 11.* College Station, TX: StataCorp, LP.

Straus, M.A. (1979). Measuring intra family conflict and violence: The Conflict Tactics (CT) Scales. *Journal of Marriage & the Family, 41*(1), 75-88.

Ware, J.E., Kosinski, M., Bayliss, M.S., McHorney, C.A., Rogers, W.H., Raczek, A. (1995). Comparison of Methods for Scoring and Statistical Analysis of SF-36 Health Profiles and Summary Measures: Summary of Results from the Medical Outcomes Study. *Medical Care, 33*(S4), AS264-79.

Wight, R.G., Aneshensel, C.S., Murphy, D.A., Miller-Martinez, D., Beals, K.P. (2006). Perceived HIV stigma in AIDS caregiving dyads. *Social Science & Medicine, 62*(2), 444-56.

Wolf, M.S., Davis, T.C., Osborn, C.Y., Skripkauskas, S., Bennett, C.L., Makoul, G. (2007). Literacy, self-efficacy, and HIV medication adherence. *Patient Education & Counseling, 65*(2), 253-60.

Table 6.1. Demographic characteristics of all participants (*N*=383)

Demographic Characteristic	Total *N*(%) or Mean (SD)
Race	
African-American/Black	351 (91.6)
White	27 (7.0)
Other	5 (1.4)
Education	
8th grade or less	26 (6.8)
Some high school	150 (39.2)
High school diploma/GED	145 (37.9)
Some college/above	62 (16.1)
HIV stigma	
Low	107 (27.9)
Medium	101 (26.4)
High	175 (45.7)
Negative social exchange	
Low	160 (41.8)
Medium	127 (33.2)
High	96 (25.1)
Health-related support	
Low	148 (38.6)
Medium	105 (27.4)
High	130 (34.0)
Main supporter type	
Other	89 (23.3)
Main partner	121 (31.6)
Kin	173 (45.2)
ART-related support	
Rarely	42 (11.7)
Sometimes	129 (35.9)
Often	188 (52.4)
Physical functioning	
Low	135 (35.2)
Medium	116 (30.3)
High	132 (34.5)
Optimal acute care utilization	
Suboptimal	188 (49.1)
Optimal	195 (50.9)
Viral suppression	
Detectable viral load	131 (34.2)
Undetectable viral load	252 (65.8)
Sex	
Males	235 (61.4)
Females	148 (38.6)
Age (years)	48.2 (6.3)

Table 6.2. Probability of *SUMIC* factors by latent class among African-American Indexes (*N*=351)

	C1: (43%) *Moderate SU/M I*	**C2: (25%)** *High MI*	**C3: (23%)** *Moderate SU/MI/C*	**C4: (9%)** *High SU/MI*
Active substance use				
Opiates in last 30 days	13.8***	08.1‡	17.3***	33.1***
Marijuana in last 30 days	14.2***	03.0	21.8***	47.9***
Heroin in last 30 days	20.6***	01.9	23.6***	71.3***
Cocaine or crack in last 30 days	33.4***	04.2	41.4***	100
Hallucinogens in last 30 days	02.1‡	---	---	---
Prescription drugs in last 30 days	04.0*	---	04.0‡	25.5**
Mental illness				
Diagnosed with depression	27.0**	92.5***	64.8***	95.2***
Diagnosed with bipolar disorder	---	68.6***	33.5***	75.6***
Diagnosed with anxiety or PTSD	03.6	43.0***	29.4***	61.2***
Diagnosed with schizophrenia	---	13.5**	09.6**	42.6***
Diagnosed with other psychiatric illness	01.9	07.6*	07.4*	06.7
Familial conflict				
Family rarely/never talks about problems	06.6**	12.4*	93.9***	25.4*
Family rarely/never problem solves together	04.3‡	05.9	95.9***	31.2**
Family rarely/never shows caring for each other	---	03.0	28.6***	09.7

‡*marginally significant* $p<.10$,*$p<.05$, **$p<.01$, ***$p<.001$

Table 6.3. Correlates of viral suppression - African-American Indexes (*N*=331)

	Unadjusted		Adjusted	
	IRR[a]	CI[c]	AIR[b]	CI
***SUMIC* Syndemic class**				
High Mental illness	1.31**	(1.10, 1.55)	1.35***	(1.12, 1.62)
Moderate SU/MI/C	1.29**	(1.09, 1.54)	1.38***	(1.15, 1.67)
High Sub use/Men illness	0.68‡	(0.44, 1.05)	0.81	(0.53, 1.24)
(ref: Moderate SU/MI)	1.00		1.00	
Physical functioning				
Moderate physical functioning	1.18‡	(0.97, 1.44)	1.16	(0.96, 1.40)
High physical functioning	1.25*	(1.04, 1.50)	1.23*	(1.01, 1.51)
(ref: Low physical functioning)	1.00		1.00	
HIV stigma				
Moderate stigma	0.99	(0.81, 1.21)	0.96	(0.78, 1.18)
High stigma	1.01	(0.84, 1.20)	1.01	(0.84, 1.22)
(ref: Low stigma)	1.00		1.00	
Education				
Some high school	1.49	(0.89, 2.47)	1.52‡	(0.93, 2.48)
High school diploma/GED	1.61‡	(0.97, 2.68)	1.52‡	(0.93, 2.47)
Some college or above	1.78*	(1.06, 2.98)	1.72*	(1.04, 2.85)
(ref: 8th grade or less)	1.00		1.00	
Negative social exchange				
Medium exchange	1.02	(0.86, 1.20)	1.05	(0.88, 1.24)
High exchange	0.92	(0.75, 1.12)	1.02	(0.82, 1.28)
(ref: Low exchange)	1.00		1.00	
Main supporter relationship				
Main partner	1.11	(0.90, 1.37)	1.35*	(1.05, 1.74)
Kin	1.08	(0.88, 1.31)	1.27*	(1.00, 1.62)
(ref: Other/No supporter)	1.00		1.00	
ART-related support				
Sometimes	0.91	(0.74, 1.13)	0.85	(0.69, 1.04)
Often	0.82‡	(0.66, 1.01)	0.79*	(0.64, 0.97)
(ref: Rarely)	1.00		1.00	
Health-related support				
Medium support	1.16‡	(0.98, 1.36)	1.16‡	(0.97, 1.39)
High support	0.91	(0.75, 1.11)	1.00	(0.82, 1.23)
(ref: Low support)	1.00		1.00	
Age (49 years & up)	1.12	(0.96, 1.3050)	1.15‡	(0.97, 1.36)
Sex (Females)	0.98	(0.84, 1.15)	1.07	(0.91, 1.27)

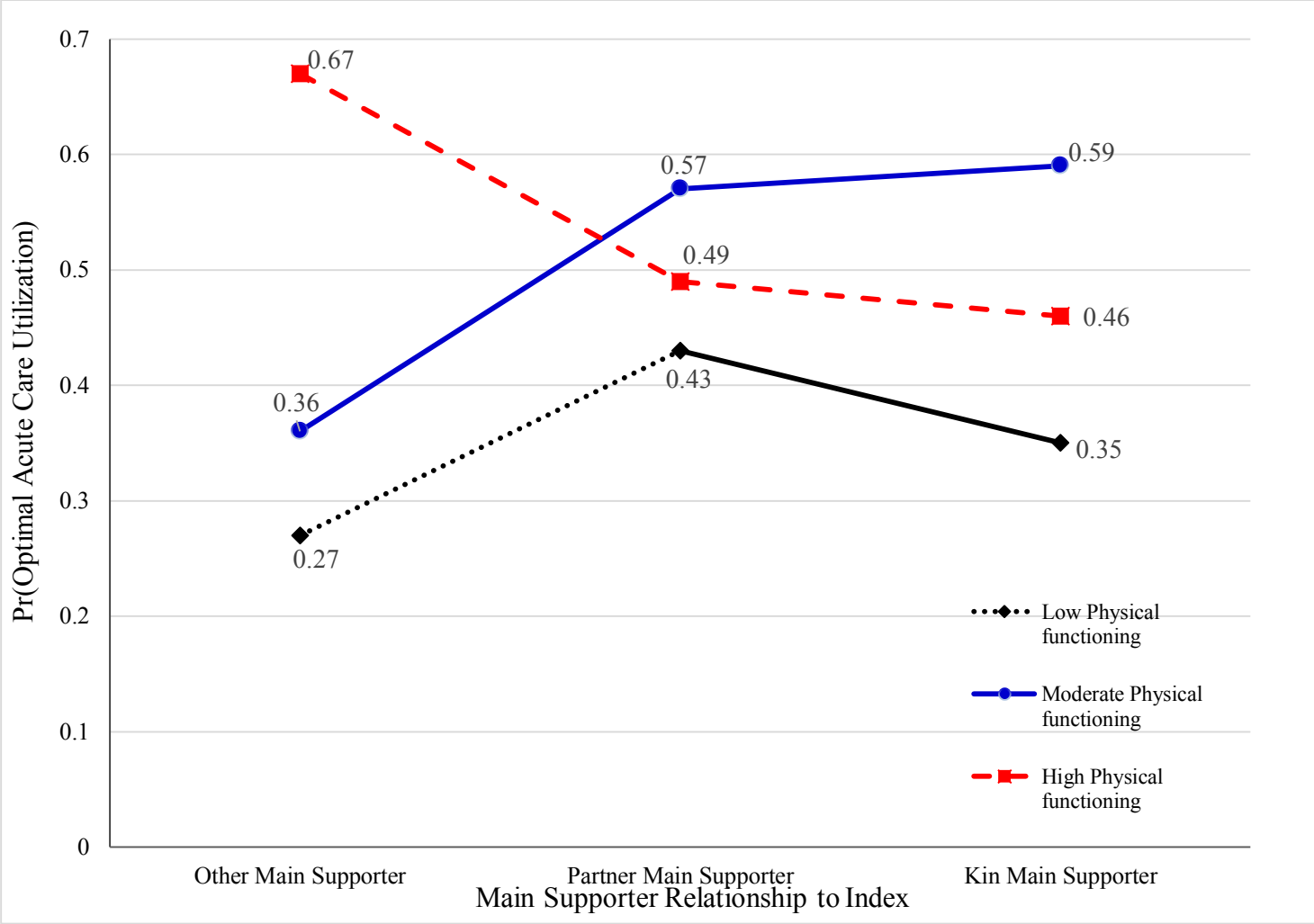
‡*marginally significant* $p<.10$, *$p<.05$, **$p<.01$, ***$p<.001$ [a]IRR = Incidence Rate Ratio [b]AIR = Adjusted Incidence Rate Ratio [c]CI = 95% Confidence Interval

Table 6.4. Correlates of optimal acute care utilization - African-Americans (*N*=331)

	Unadjusted		Model 1[d]		Model 2[e]	
	IRR[a]	CI[c]	AIR[b]	CI	AIR	CI
***SUMIC* Syndemic class**						
High Mental illness	0.63**	(0.47, 0.84)	0.66**	(0.48, 0.89)	0.63**	(0.46, 0.86)
Moderate SU/MI/C	1.05	(0.85, 1.30)	1.10	(0.87, 1.38)	1.03	(0.82, 1.30)
High Sub use/Mental illness	0.31**	(0.15, 0.65)	0.35**	(0.16, 0.77)	0.34**	(0.16, 0.72)
(ref: Moderate SU/MI)	1.00		1.00		1.00	
ART-related support						
Sometimes	0.89	(0.68, 1.17)	0.89	(0.70, 1.13)	0.93	(0.73, 1.18)
Often	0.65**	(0.49, 0.86)	0.74*	(0.57, 0.95)	0.77*	(0.60, 1.00)
(ref: Rarely)	1.00		1.00		1.00	
HIV stigma						
Moderate stigma	0.93	(0.72, 1.20)	0.92	(0.72, 1.18)	0.94	(0.74, 1.20)
High stigma	0.81‡	(0.64, 1.02)	0.83	(0.66, 1.05)	0.87	(0.69, 1.09)
(ref: Low stigma)	1.00		1.00		1.00	
Education						
Some high school	0.91	(0.59, 1.42)	1.08	(0.70, 1.66)	1.04	(0.68, 1.59)
High school diploma/GED	1.08	(0.70, 1.66)	1.23	(0.81, 1.88)	1.19	(0.79, 1.81)
Some college or above	0.97	(0.60, 1.57)	1.17	(0.72, 1.88)	1.07	(0.66, 1.74)
(ref: 8th grade or less)	1.00		1.00		1.00	
Negative social exchange						
Medium exchange	0.94	(0.74, 1.20)	0.87	(0.69, 1.11)	0.86	(0.68, 1.08)
High exchange	1.06	(0.83, 1.35)	1.07	(0.83, 1.38)	1.05	(0.81, 1.35)
(ref: Low exchange)	1.00		1.00		1.00	
Health-related support						
Medium support	0.76*	(0.60, 0.97)	0.83	(0.66, 1.06)	0.83	(0.66, 1.05)
High support	0.61***	(0.47, 0.79)	0.73*	(0.55, 0.97)	0.70*	(0.53, 0.93)
(ref: Low Support)	1.00		1.00		1.00	
Sex (Females)	0.90	(0.73, 1.12)	1.11	(0.88, 1.39)	1.14	(0.90, 1.44)
Age (49 years & older)	1.14	(0.93, 1.40)	1.12	(0.91, 1.39)	1.11	(0.89, 1.37)
Physical functioning						
Medium physical function.	1.60**	(1.19, 2.14)	1.53**	(1.14, 2.07)	---	
High physical functioning	1.74***	(1.33, 2.30)	1.45**	(1.08, 1.94)	---	
(ref: Low physical function.)	1.00		1.00		---	
Main supporter relationship						
Main partner	0.93	(0.71, 1.23)	1.09	(0.80, 1.49)	---	
Kin	0.97	(0.74, 1.25)	1.05	(0.80, 1.38)	---	
(ref: Other/No supporter)	1.00		1.00		---	
Phys func X Main supporter						
Low phys func **X** Partner					1.59	(0.69, 3.66)
Low phys func **X** Kin					1.32	(0.61, 2.86)
Med phys func **X** Other					1.33	(0.54, 3.27)
Med phys func **X** Partner					2.13‡	(0.99, 4.59)
Med phys func **X** Kin					2.20*	(1.05, 4.61)
High phys func **X** Other					2.49*	(1.19, 5.19)
High phys func **X** Partner					1.83	(0.87, 3.85)
High phys func **X** Kin					1.72	(0.83, 3.55)
(ref: Low phys func **X** Other)					1.00	

‡*marginally significant* $p<.10$, *$p<.05$, **$p<.01$, ***$p<.001$ [a]IRR = Incidence Rate Ratio [b]AIR = Adjusted Incidence Rate Ratio [c] CI = 95% Confidence Interval [d]=Main effects model [e]=Model with main effects and interaction term (Main supporterXPhysical Functioning)

Figure 6.1. Marginal effects depicting interaction of physical functioning on association between main supporter relationship and optimal acute care utilization among African-American Indexes (*N*=331)



CHAPTER SEVEN: DISCUSSION

OVERVIEW

The overarching purpose of this dissertation research was to identify correlates of HIV medical adherence among African-American persons living with HIV (PLHIV), in order to make recommendations to researchers and healthcare providers to improve their health outcomes. By examining factors such as sex differences, latent syndemics among HIV-positives, and differing dimensions of adherence, this research has contributed a comprehensive analysis of correlates of adherence – at both individual-level and interpersonal-level determinants of health. Overall, study results suggest that achievement of undetectable viral suppression (UVL) was more common than optimal acute care utilization (OAU) among this cohort of African-American persons who inject drugs and are living with HIV (PWID PLHIV; 65.8% vs. 50.9%, respectively)

This dissertation research also contributes to a growing body of literature on the effects of Syndemic Theory in HIV, yet contributes a unique syndemic analysis of HIV tertiary prevention of health burden, rather than HIV primary prevention of HIV risk. Moreover, this research considered the definition and measurement issues surrounding adherence. Additionally, this research proposed and tested a new definition of adherence which considers both medication and therapeutic adherence elements among persons who inject drugs, who are traditionally under-represented in health services research and HIV adherence literature as well.

The present chapter summarizes the investigation of each research aim, along with relevant findings and conclusions from each aim. These aims were accomplished via quantitative secondary analyses of a study which examined psychosocial health outcomes among a cohort of low-income, predominantly African-American, current or former

injection drug-using PLHIV in Baltimore, Maryland. Considering the context of Baltimore City, African-American females now represent the majority of new HIV diagnoses (Baltimore City Commission on HIV/AIDS Prevention and Treatment, 2005). As a result, the devastation is so vast in certain areas of the city that it rivals HIV rates in sub-Saharan Africa (U.S. Department of Health and Human Services Health Resources and Services Administration, 2008). Nine out of every ten new HIV cases in Baltimore are among African-Americans, and among African-American females in Baltimore, the rate of AIDS diagnoses is more than twenty times that of White females (Baltimore City Commission on HIV/AIDS Prevention and Treatment, 2005). Therefore, research to inform HIV-related, and/or sex-specific interventions in this area is vital and very timely.

SUMMARY OF FINDINGS

Study Aim One and Hypothesis One

The first aim of the proposed research was to examine the association between sex and HIV medical adherence (defined as optimal acute care utilization and ART adherence) among a sample of urban African-American adult persons who inject drugs currently engaged in HIV medical care. Correspondingly, the accompanying hypothesis for this aim was that females would report lower rates of HIV medical adherence as compared to males. In Manuscript One (Chapter Four), the results of statistical analyses to address this research aim were detailed.

Consistent with observations of racial/ethnic and sex disparities, African-American women were estimated to have higher HIV incidence, and lower viral suppression than other groups (Agency for Healthcare Research and Quality [AHRQ],

2012; Prejean et al., 2011). First, purported barriers to viral suppression among PLHIV include active substance use and mental illness (AHRQ, 2012). Additionally, substance use, mental illness, and HIV are all factors which may create tension in the PLHIV's social environment, resulting in familial conflict, or chronic disagreements between family members (Dunbar, 1990; Chesney & Folkman, 1994; Feaster et al., 2010). In contrast, research suggests that health-related support and support reciprocity (mutuality) have been found to facilitate achievement of viral suppression (Edwards, 2006; Tucker, Burnam, Sherbourne, Kung, & Gifford, 2003; Knowlton et al., 2011; Mosack, & Petroll, 2009). Therefore, extant research informed the research aims, hypothesis, and variables utilized in analyses.

In these analyses, viral suppression was the only outcome of interest. This outcome was binary (1 = undetectable viral load vs. 0 = detectable viral load; Schumacher et al., 2007). Predictor variables in the present analyses were active substance use, mental illnesses diagnoses, familial conflict, patient-provider communication, and social support (e.g. main supporter relationship, religious activity, health-related support, and support reciprocity). Physical functioning and educational attainment were utilized as sociodemographic control variables, and analyses included Poisson regression with robust standard errors to account for data heteroskedasticity (inconstant variation; Long, 1997). The same model was run for separately for males and females in order to address Research Aim One, and only among African-American participants, due to theoretical importance.

Similarities between males and females' correlates of viral suppression (UVL) were identified. First, physical health and mental health are quality of life indicators

which were statistically significant correlates of viral suppression among males (physical health and mental illness), and females (mental illness). Also, for both sexes, it was protective to have main supporters who were either main partners or kin. Divergent from prior research and theoretical rationale, reciprocating support was negatively associated with viral suppression for females, where high reciprocity was associated with only one-third the likelihood of undetectable viral load, as females reporting low reciprocity to caregivers. Moreover, African-American female Indexes were more likely than African-American male Indexes to report that their main supporter was their main partners (36% vs. 28%, respectively; $p<.05$). They were also less likely to achieve viral suppression than males (67.1% vs. 65.9%, respectively; non-significant), thus providing support to Hypothesis One.

Study results indicated that males and females differences exist in the relationship between substance use, mental illness, social support, and achievement of UVL. Findings suggest that sex differences may also exist in utilization of informal caregivers and social support networks to engage in health behaviors among PLHIV. Therefore, healthcare providers should consider the impact of health-related quality of life among persons whom inject drugs and also are living with HIV (PWID PLHIV). Future research should also consider sex-specific health-related physical functioning and quality of life interventions to improve health outcomes among PWID PLHIV.

Study Aim Two and Hypotheses Two

The second research aim of interest was to determine the relationship between the *'SUMIC'* Syndemic (e.g. ***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict) and HIV medical adherence among a sample of urban African-American adult persons who inject

drugs currently engaged in HIV medical care. The accompanying hypothesis was that individuals with higher *SUMIC* Syndemic burden would report lower HIV medical adherence as compared to individuals who had lower syndemic burden. Syndemic Theory refers two or more co-morbid conditions, which interact synergistically, and collectively increase disease burden in a given population (Singer, 1996; Singer & Clair, 2003).

The *'SUMIC'* Syndemic places African-Americans, and particularly African-American women, at high risk of death and/or disability related to HIV/AIDS in the United States. Therefore, the present analyses (Chapter Five) examined the role of Syndemic Theory in HIV-related health burden. In Chapter Five, the *SUMIC* Syndemic was investigated as a latent class regression, where individuals were classified into their most likely class membership based on their recent substance use, lifetime mental illness diagnoses, and existing levels of familial conflict. In Chapter Six, *SUMIC* Syndemic class was utilized as a categorical predictor of aforementioned HIV medical adherence.

Latent class analyses (LCA) identified unique patterns of behavioral risk (Ahn et al., 2008; Collins & Lanza, 2010). Active substance use was coded as use of opiates, marijuana, heroin, cocaine or crack, hallucinogens, and/or prescription drug use in the past month; mental illness was coded as having ever been diagnosed by a doctor with major depression, bipolar disorder, anxiety or post-traumatic stress disorder (PTSD), schizophrenia, and/or any other psychiatric condition; familial conflict was coded as family members rarely discussing problems, problem-solving together, and/or show caring for one another.

HIV medical adherence was defined as no acute care utilization and HIV viral suppression. Optimal acute care utilization (OAU) was defined as no Emergency

Department visits or overnight hospitalizations in the prior 6 months. HIV viral suppression was defined as previously identified. Sex was coded as 1= Males, vs. 2 = Females. Analyses included univariate statistics, factor analyses, and latent class logistic regression. Model fit statistics and theoretical significance identified a four-class solution.

Based on LCA among African-American participants (N=351), 9% of participants had high substance use/mental illness prevalence (Class 4); 23% had moderate levels of all 3 factors (Class 3); 25% had high mental illness (Class 2); and 43% had moderate substance use/mental illness (Class 1). Compared to Class 4, females had 79% lower odds of being in Class 1 or Class 3 (p<.01 and p<.01, respectively). Moreover, Class 4 was overwhelmingly female (68%), and represented the individuals with the highest syndemic burden. Overall, odds of HIV medical adherence were two to four higher in Classes 1-3 as compared to Class 4, thereby addressing Research Aim Two and providing support to Hypothesis Two.

Although only two previous studies have applied Syndemic Theory to HIV adherence outcomes, some parallels can be drawn between our results and previous investigations (Blashill et al., 2014; Mizuno et al., 2014). First, as with most of the previous syndemic models, the present sample was low-income racial minorities, with high rates of substance use, mental illness, and moderate to high rates of familial conflict (violence; Senn et al., 2010; Blashill et al., 2014; Mizuno et al., 2014). Our results suggest that women had the highest rates of concurrent substance use and mental illness diagnoses, and lowest HIV medical adherence, which is similar to findings by Illangasekare et al (2013). Therefore, while the *SUMIC* Syndemic is non-gender specific, interventions must consider gender differences in syndemic burden and HIV medical

adherence, such that women may have unique contextual factors which reduce their likelihood of adherence.

Study Aim Three and Hypothesis Three

The final dissertation research aim was to examine sex and social support as potential moderators in the relationship between the *SUMIC* Syndemic and HIV medical adherence among a sample of urban African-American adult persons who inject drugs engaged in HIV medical care. The corresponding hypothesis was that females would report higher rates of the *SUMIC* Syndemic and lower rates of HIV medical adherence as compared to males. While research suggests that HIV medical non-adherence is problematic, relatively few individual and socio-contextual correlates of adherence have been consistently associated with increased medical adherence.

Individual factors refer to a person's characteristics which may make them vulnerable to HIV medical non-adherence (Joint United Nations Programme on HIV/AIDS [UNAIDS], 1998), while socio-context refers to cultural norms and practices, that act as barriers to positive HIV health outcomes (UNAIDS, 1998; Galvan, Davis, Banks, & Bing, 2008). Therefore, these analyses utilized both individual-level correlates (e.g. age, sex, education) and socio-contextual correlates (e.g. HIV stigma, negative social exchange). The outcomes of interest were HIV medical adherence: viral suppression (UVL) and optimal acute care utilization (OAU). Analyses included univariate frequencies, bivariate analyses, and multivariate Poisson regression with robust standard errors. Regression analyses were run with African-Americans only. Post-hoc analyses were conducted to test for potential interactions between social support

variables (e.g. negative social exchange, main supporter relationship, ART-related support, and health-related support), sex, and other correlates of interest.

Results indicated that *SUMIC* Syndemic class membership was a significant predictor of viral suppression. Conflicting with expectations, individuals with moderate *SUMIC* Syndemic burden had 1.4 times the likelihood of UVL as individuals with low syndemic burden (Adjusted Incidence Rate Ratio [AIR] = 1.38; 95% Confidence Interval [95% CI] = 1.15, 1.67). Contrary to its associations with UVL, higher *SUMIC* Syndemic burden predicted lower likelihood of OAU. Nonetheless, this finding is supported by previous research in HIV syndemics, where increased syndemic burden has been consistently associated with lower engagement in HIV medical care and positive health outcomes (Meyer, Springer, & Altice, 2011). Post-hoc analyses revealed that physical functioning moderated the relationship between main supporter type and optimal acute care utilization. While theory would posit that highly physically-functional individuals should have had the lowest use of acute care services (OAU), this only held for individuals with non-kin and non-partner supporters. For all other levels of physical functioning, having a kin or partner supporter increased the likelihood of UVL and OAU. African-American females were less likely than males to achieve both viral suppression (67.1% vs. 65.9%; non-significant) and optimal acute care utilization (53.9% vs. 48.5%; non-significant).

African-American females were also nearly seventy percent of the *SUMIC* Syndemic class with the highest burden; thus Hypothesis Three was supported. The surprising relationship between health-related support and OAU, and the interaction between main supporter relationship and physical functioning on OAU, suggest that

socio-contextual factors may be important for OAU.

The present study lends support to the importance of examining syndemic factors as predictive of adherence outcomes. Additionally, medication and therapeutic adherence outcomes (UVL and OAU) had distinct relationships with syndemic and social support factors. Overall, among both sexes, UVL was more common than OAU. Results suggest that even among individuals enrolled in HIV primary care and on ART, overuse of emergency health care was high (49%). It is possible that viral suppression is a more individualized measure of adherence, and therefore under the control of the PLHIV, while acute care utilization is more interpersonally-influenced. Therefore, future studies should also examine these factors to make treatment recommendations to improve adherence and reduce unnecessary health care utilization.

STUDY STRENGTHS AND LIMITATIONS

Limitations

The contributions of this study are subject to several limitations. First, all of the analyses conducted within this study were cross-sectional. Research suggests, however, that factors such as HIV medical adherence, active substance use, and social support (e.g. main outcome and study correlates) fluctuate over time. Therefore, inference regarding the longitudinal relationship between these factors cannot be ascertained. Similarly, there is dissent regarding establishing the temporality of the aforementioned syndemic factors of substance use, mental illness, and familial conflict. As discussed in Chapters One, Three, and Five, research suggests that these factors are each individually established correlates, co-morbidities, and outcomes related to HIV (Centers for Disease Control and Prevention [CDC], 2012). From a treatment perspective, however, results suggest that

presence of *SUMIC* Syndemic factors may hold more precedence than temporality for treatment, and require comprehensive strategies for tertiary prevention among PLHIV.

Next, while HIV medical adherence was defined and studied in these analyses, distinction must be made between types of adherence. Medication adherence refers solely to an individual's ability to adhere to the prescription regimen recommended by a healthcare provider (Burke & Dunbar-Jacob, 1995; DiMatteo, 2004). Beyond this issue, however, is the determination of what adherence is (Machtinger & Bangsberg, 2005). Additionally, viral suppression was conceptualized in this study as a biomarker proxy for medication adherence. However, it is possible for PLHIV to report ART adherence, which may or may accompany achievement and maintenance of viral suppression. Next, in consideration of operationalization of adherence, large differences may exist between an individual's likelihood to adhere to HIV medication, versus their ability to adhere to their healthcare provider's larger list of recommendations (DiMatteo, 2004). Therefore, inferences regarding factors such as lack of transportation to attend regular follow-up appointments, or change in health insurance status due to loss of coverage cannot be made (Gullette, Wright, Booth, & Steward, 2010).

Similarly, a related limitation is illuminated, as the very nature of HIV medical adherence implies access to regular medical care, which is often not reflective of the population experiencing syndemic risks (Gullete et al., 2010; Booker, Harding, & Benzeval, 2011). All of the individuals in this study had medical insurance and/or access to regular HIV medical care, and are not necessarily representative of the population with highest syndemic risk. Thus, *SUMIC* Syndemic individuals are a highly unique group with respect to their HIV risk, health practices, and antiretroviral therapy (ART)

adherence. Similarly, while the definition of optimal acute care utilization builds on the prior HCSUS study definition (Fremont et al., 2007), reasons for acute care utilization in the sample were unknown and therefore use may not be suboptimal.

It is possible that acute care services were used appropriately, for issues other than chronic HIV-related illness. Nonetheless, because this cohort of PLHIV were relatively engaged in care, there should have been little need for acute care services, thereby justifying focus on OAU as an outcome of interest. Moreover, research to identify factors associated with OAU are critical, as persons who inject drugs are especially vulnerable to sub-optimal acute services use. Next, several of the constructs included in this study could have been operationalized differently.

For example, active substance use also includes alcohol use and/or binge drinking, which was excluded in the present analyses due to results of factor analyses. Similarly, the items referred to as familial conflict may be more specifically measuring family problem-solving constructs. Therefore, differential syndemic burden may be identified with inclusion of items which measured more overt conflicts between family members. Similarly, definitions of what constitutes a family vary widely, and therefore could result in differential conflict prevalence as well. Finally, three measures, Relationship to main support, ART-related support, and Religious activity were identified with a single item; therefore no factor analyses or reliability estimate were ascertained. However, inclusion of single items has been defended in previous research, namely because they may identify specific behavioral factors associated with outcomes of interest in a given study population (Rossiter, 2008).

As discussed, the PLHIV included in this study were nearly all African-American and low-income, and all had a history of injection drug use (primarily heroin and cocaine). Therefore, this study's findings may not be widely generalizable to all PWID PLHIV. Next, stratified analyses may have led to a loss of statistical power to detect findings. However, these decisions, which included sex stratification and race-specific analyses were theoretically justified and meaningful. Finally, "sex" and "gender" were used interchangeably in analyses and interpretation of findings. However, the former refers to physical and biological characteristics, while the latter refers to socio-cultural identity (American Psychological Association [APA], 2011). Within the context of HIV, many individuals face increased HIV risk and negative health outcomes due to differences they perceive between their sex and gender, such as transgender individuals. Therefore, future studies should include measurement of both of these factors, as well as increased inclusion of transgendered PLHIV, to further understand the role of social support and syndemic factors in adherence (APA, 2011; CDC, 2012).

Strengths

Despite these limitations, the proposed study fills a critical gap in the HIV literature, by identifying unique correlates of adherence in one of the most vulnerable populations currently being ravaged by HIV/AIDS in the U.S. First, the parent project, the BEACON study, was one of few to recruit almost exclusively low-income, African-American HIV-positive individuals (PLHIV), who are underrepresented in HIV disparities research. Moreover, all of these individuals were current or former persons who inject drugs (PWID), whom represent a "hard-to-reach" population for research and intervention (Needle et al., 2005). Second, this study contributes evidence of sex

differences in medical adherence outcomes, among a marginalized population of African-American PWID PLHIV. Moreover, these disparities were framed with consideration of both a conceptual framework (Social Cognitive Theory of Gender Differentiation) and a theoretical orientation (Theory of Gender and Power; Chapter Two and Chapter Four), which has implications for future research and interventions.

Third, this study simultaneously evaluated several dimensions of social support, which is a unique contribution to the literature. Extant research purports that social support is protective from negative HIV health outcomes such as non-adherence; yet most studies do not differentiate multiple types and sources of social support and HIV outcomes. The present dissertation research tested multiple sources including: relationship between main caregiver and care recipient, enacted health-related support (beyond main caregiver), religious activity (conceptualized as organizational or communal support), and enacted ART-related support. Therefore, this study highlights that social support itself is not sufficient for prevention of negative health outcomes, Therefore, future research and interventions should expand on these findings, by including informal caregivers in HIV outcomes research, along with evaluation of syndemic factors over time among PWID PLHIV.

Fourth, the present research critically examined the current state of Syndemic Theory in the HIV literature. Since the initial appearance of the *SAVA* Syndemic (substance use, violence, HIV risk among low-income urban women; Singer, 1996), several other syndemic models have been theorized to conceptualize HIV infection risk. HIV-positive individuals with a history of substance use and/or mental illness represent an extremely vulnerable population with respect to risk for HIV infection, as well as poor

health outcomes such as lower rates of ART adherence. However, to date only two studies have applied Syndemic Theory to assess HIV-related adherence outcomes (Blashill et al., 2014; Mizuno et al., 2014). However, no studies have applied this theory to assess adherence among exclusively African-American PWID PLHIV. Therefore, this study defined and tested a new syndemic model. The present study findings suggest that *SUMIC* Syndemic (***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict) factors had adherence implications. Individuals with higher syndemic burden had lower likelihood of OAU (Chapter Six). Moreover, syndemic burden was disproportionately seen among females, and African-American females had lower overall HIV medical adherence rates than males (Chapter Five and Chapter Six).

Finally, previous research studies have established controversy surrounding several aspects of defining and measuring adherence. These issues include variations in the literature regarding on issues such as appropriate data sources, and cutoff criteria to define adherence-related outcomes (Machtinger & Bangsberg, 2005). The present research defined 'HIV medical adherence' as both viral suppression (UVL) and optimal acute care utilization (OAU). The former outcome is a specific proxy for medication adherence outcome, while the latter is a therapeutic adherence term defined by The HIV Cost and Service Utilization Study, and refers to minimization of emergency room visits and inpatient care (Shapiro et al., 1999). Consideration of UVL is additionally conceptualized as an individual-level adherence outcome, while OAU is an interpersonal-level adherence outcome. Consideration of multiple levels of socio-environmental factors, as was the case in the present dissertation research, is critical to improvement of health outcomes among PWID PLHIV.

FUTURE DIRECTIONS

Research and intervention implications

The methods and findings from this dissertation suggest several areas that merit further investigation. First, Social Cognitive Theory of Gender differentiation has relevance to disparities in HIV medical adherence among African-American women PLHIV. One construct of this theory is self-efficacy, or an individual's personal agency or belief in their ability to produce desired outcomes (Bussey & Bandura, 1999; Bandura, 1998). Extant research demonstrates that African-American women consistently report lower levels of perceived self-efficacy with respect to engaging in HIV-related health behaviors (Gullette, Wright, Booth, & Stewart, 2010; Edwards, 2006; Buseh & Stevens, 2008; Schröder, Hobfoll, Jackson, & Lavin, 2001; Wingood & DiClemente, 2000).

Reynolds et al., (2004) and Schneider, Kaplan, Greenfield, Li, and Wilson (2004) found interventions to increase self-efficacy among African-American females were predictive of increased ART adherence and increased engagement in care with HIV health care providers. Combined with gender-specific findings from the present research, future health programs should specifically target African-American women, and include activities to increase their health self-efficacy. Consistent with these previous findings, study results indicated that African-American females were less likely than males to achieve both viral suppression and optimal acute care utilization. Results also suggested that women were more likely than men to report that their main HIV supporter was their significant other (37.2% vs. 28%, respectively; $p<.05$).

Therefore, one possible avenue to increase African-American females' self-

efficacy and HIV medical adherence could be a couples-based intervention for African-American PLHIV women and their male partners in Baltimore. The intervention would be evidence-based, building off of previous interventions among African-American PLHIV women (Holstad, DiIorio, & Magowe, 2006). Additionally, a recent study of PLHIV women who are racial/ethnic minorities found that among these women, those with functional limitations also reported nearly twice as many mentally unhealthy days in the past month, as compared to the general US population (Quinlivan et al., 2015). Similar associations with quality of life factors were found with in the present study; therefore, future interventions should address physical and mental health factors among PLHIV women (Chapter Four).

In such an intervention, a health education program with PLHIV women participants could identify specific areas of intervention they are interested in, and delivered via motivational interviewing techniques (Holstad et al., 2006). The health education would incorporate physical activity, as well as stress reduction techniques to improve and maintain mental health outcomes. Additionally, this intervention would be with couples, and would include gender-specific communication skills, and couples role-playing issues such as antiretroviral therapy. As such, future intervention work could incorporate targeted interventions for PLHIV women of color, with unique and specific health-related quality of life needs, and integrating behavioral health care with somatic health care (Quinlivan et al., 2015; Holstad et al., 2006).

Irrespective of gender, study results indicated that *SUMIC* Syndemic factors (***S***ubstance ***U***se, ***M***ental ***I***llness, and Familial ***C***onflict) may be contributing to negative health outcomes among African-American PLHIV (Chapter Five and Chapter Six).

Results indicated that active substance use, mental illness, and familial conflict rates were high in this population (Chapter Five). Moreover, while viral suppression was achieved by nearly two-thirds or participants, half of participants were utilizing Emergency Department services despite having resources such as insurance and access to primary care (Chapter Five and Chapter Six).

Previous research suggests factors such as substance use and familial conflict can be effectively addressed in group-based settings (Rotheram-Borus et al., 2012; Rowe et al., 2007). Given the prevalence of both of these issues in the present study, findings also suggest the potential effectiveness of a family-focused intervention. Rather than the aforementioned dyadic intervention, the family would be considered as a single unit, to collectively learn coping skills to reduce the burden of these issues. In this type of program, individuals experiencing syndemic burden would identify areas of health education as well, but also learn conflict resolution techniques, along with with family members who are willing to participate.

Zea, Reisen, Poppen, Bianchi, and Echeverry (2005), Rotheram-Borus et al. (2011) and Tolle (2009) cite integrated HIV and family therapy as reducing rates of mental illness and substance use among participants, irrespective of age and/or type of familial conflict (e.g. inter-spousal disagreement, parent-child, sibling). Furthermore, typical HIV research and interventions do not address the social context of patients' non-adherence (McNair & Prather, 2004). Therefore, the proposed dyadic and family-level interventions consider socio-contextual factors to increase medical adherence in *SUMIC* Syndemic individuals (Gray et al., 2011; Longshore, Grills, Atiglin, & Annon, 1997).

Lastly, study findings indicate that patient-provider communication was a significant predictor or viral suppression among African-American women PLHIV (Chapter Four). Study results also suggest that while temporal patterns of the onset of syndemic factors may vary, the presence of *SUMIC* Syndemic factors may hold more precedence than temporality, from a treatment standpoint (Chapter Five). Extant literature also supports cross-cultural medical education as a means to reduce such HIV disparities (Saha et al., 2013). As such, healthcare provider education may serve as a crucial pathway to increase adherence among these individuals.

A possible intervention may be with healthcare providers, to train them in evidence-based community skills and cultural competence, both of which are shown to increase adherence outcomes (Saha et al., 2013). The proposed intervention could also expand beyond cultural competence via implementation of structural competence training with providers (Metzl & Hansen, 2014). While closely related to cultural competency, structural competence acknowledges health-related factors beyond patient ethnicity, such as food access, institutional racism, and political infrastructure (Metzl & Hansen, 2014). This type of training may better prepare providers to understand the etiology of syndemic factors in PLHIV patients, as well as the larger impact of structural factors such as wealth disparities. Also, the intervention could include training nurses, who often serve as the bridge between physicians and patients, and may be more responsible for these patients' adherence (Radcliff, 2000). Ultimately, educating patients, family members or support network members, and healthcare providers is a multi-pronged approach with greater potential to reduce HIV disparities than individual-focused intervention approaches.

Policy and programmatic implications

The implications of this dissertation research have grounding in several major legislative initiatives. First, in 1984, when the HIV epidemic began in the United States, the federal government created block grant legislation requiring every state to set aside five percent of its block grant allocation to provide new or expanded substance abuse treatment services for women (Tracy & Martin, 2007; Bride, 2001; Breitbart, Chavkin, & Wise, 1994). States were encouraged to develop 'women's set-aside funds' for the creation of ancillary services for women, and women-only treatment centers (Bride, 2001; Breibart et al., 1994). Despite this, several studies posit that use of the "women's set-aside" has been unevenly implemented across states, and is declining in priority due to other critical shortages in HIV treatment, and funding cuts for HIV-specific research studies (Tracy & Martin, 2007).

The current state of research that includes the women originally included in "set-aside" funding is specific to low-income women with substance abuse history. The present dissertation research demonstrates that African-American PLHIV women had disparate outcomes as compared to their male counterparts. Specifically, these women did not benefit from the presence of social support, which correlated in both lower rates of viral suppression, and higher rates of Emergency Department utilization (Chapter Four and Chapter Six). Moreover, these women comprised the majority of individuals with *SUMIC* Syndemic burden (Chapter Five). Therefore, the present research provides additional evidence to support the increased and continued need for set-aside funding and interventions specifically targeting low-income, African-American women PLHIV.

Second, much of the recommendations set forth in the recent National HIV/AIDS Strategy (NHAS) identify critical areas for addressing improvement in HIV health

disparities. Two of the main goals for the NHAS are to: 1) improve access to medical care and health outcomes; and 2) reduce HIV health disparities (Yehia & Frank, 2011). However, nearly half of PLHIV progress to an AIDS diagnosis within three years of being diagnosed with HIV. Thus, many PLHIV have substantial barriers to linkage and retention in care (Yehia & Frank, 2011; CDC, 2009). In Baltimore, Maryland, where the present study was conducted, the situation is even more dire.

In 2010, the average time from HIV diagnosis to AIDS diagnosis was five years among PLHIV in Baltimore (Maryland Infectious Disease and Environmental Health Administration [MIDEHA], 2012). Thirty-five percent of these PLHIV were diagnosed with AIDS within one year of their HIV diagnosis (MIDEHA, 2012). Therefore, interventions to improve medical services use and health outcomes in this population are critical. While the initiative has remained under-funded, a recent assessment of the NHAS has suggested that health care coverage for PLHIV has been improved for millions of PLHIV, including those at-risk of, or currently facing, homelessness (U.S. Department of Health and Human Services [HHS], 2012).

Moreover, in 2012, the HHS began funding the Care and Prevention in the United States demonstration project (CAPUS) to reduce HIV-related disparities in eight cities (CDC, 2014). The increasing prevalence of HIV/AIDS in the area, coupled with findings from this research, demonstrate the need for the CAPUS program in Baltimore to continue addressing the epidemic needs of this population. Third, beginning in 2014, the Affordable Care Act (ACA) requires that all new small group and individual market plans cover mental health and substance use disorder services, at equal parity with medical and surgical benefits (Beronio, Po, Skopec, & Glied, 2013). As such, this

regulation is an extension of the Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008.

The ACA is purported to extend coverage for up to one-third of people with individual market coverage, to include treatment of substance use disorders and mental illness (Beronio et al., 2013). However, findings of this research suggest that additional efforts must be used to target PLHIV. While PLHIV may qualify for disability through Social Security, which offers more behavioral healthcare coverage than Medicaid alone, most do not meet the necessary qualifications for coverage until years after their initial HIV diagnosis (Social Security Administration, 2005). As a result, many individuals with concurrent HIV, substance use disorders, and mental illnesses are unable to access the services they qualify for, even when they attempt to enroll in care. In the present study, suboptimal acute care utilization and syndemic burden were extremely high, which adversely affected HIV treatment outcomes, even in this sample of PWID PLHIV engaged in medical care. Therefore, insurance coverage and linkage to care is merely one step to improving quality of life and health outcomes among PLHIV.

Finally, the lifetime cost of HIV care for HIV-positive individuals in the United States is nearly half a million dollars, and it increases every year (Schackman et al., 2006). These increased expenditures translate to rising health care costs across many urban areas, where HIV is approaching generalized epidemic proportions. As demonstrated in the present research, tertiary prevention of HIV disparities is crucial. Beyond the issue of cost, however, is that of disability and quality of life. African-American female PLHIV, and those with syndemic substance use, mental illness, and familial conflict, suffer years and quality of life lost due to their illness burden. Even with early linkage and retention

in care, African-American females still stand to lose ten years of their lives prematurely due to HIV illness (Schackman et al., 2006; Losina et al., 2007). Integration of behavioral healthcare, and primary somatic healthcare services, is critical now more than ever, and has the potential reduce healthcare costs by reducing unnecessary acute care services use.

CONCLUSIONS

Despite increasing rates of HIV morbidity and mortality, relatively few studies of tertiary HIV prevention among African-American persons living with HIV (PLHIV) and persons who inject drugs have been conducted (El-Bassel, Caldeira, Ruglass, & Gilbert, 2009; Schröder, Hobfoll, Jackson, & Lavin, 2001). Therefore, this study of medical adherence among African-American PWID PLHIV addresses a critical gap in the literature. This dissertation research contributes simultaneously to understandings of the role of perceived and enacted syndemic factors and social support, which yielded further understanding sex differences in the effects of social support on HIV health outcomes.

This dissertation research tested both a new definition of adherence, and a new Syndemic Theory among African-American PLHIV in Baltimore, Maryland, which has the fifth highest number of AIDS cases among U.S. cities. (Baltimore City Commission on HIV/AIDS Prevention and Treatment, 2005). Nationally, the rates of HIV/AIDS among African-American women have increased faster than every other racial/ethnic group (CDC, 2012). In Baltimore, the same trend is seen among African-American females as compared to males. (Baltimore City Commission on HIV/AIDS Prevention and Treatment, 2005). Study findings also have important implications beyond the context of Baltimore, Maryland.

The advent of antiretroviral therapy and increased HIV education and testing has seen a national reduction in HIV rates in the last two decades (CDC, 2012). However, these advancements are lost in key groups such as African-Americans, and in urban areas such as Baltimore. Moreover, strained social support and community resources predict both higher risk of HIV infection, and higher risk of negative HIV health outcomes among African-Americans, and females especially (Robertson, 2006; Herek, Capitanio, & Widaman, 2002).

As mentioned, collective efficacy is reduced in African-American communities via less access to resources, as well as the overabundance of disjointed family units and multiple caregivers usually present in the African-American household (Wingood & DiClemente, 2000; Robertson, 2006). Next, current behavior change interventions are usually exclusive of social support structures (Beatty, Wheeler, & Gaiter, 2004; Neumann et al., 2002). Findings suggest that social support dynamics and structures, at both the interpersonal and familial levels may be predictive of adherence. The present dissertation research provides evidence of the need for inclusion of informal caregivers, in healthcare programs designed to increase adherence among PWID PLHIV.

Therefore, the contributions of this research can directly inform interventions to improve health outcomes among those most negatively impacted by the HIV epidemic: low-income, African-American PWID PLHIV. Findings suggest that social support structures are important determinants of health outcomes in this population, and that health education may improve health outcomes such as optimal acute care utilization. Finally, results suggest that training healthcare providers to screen and treat syndemic factors is another important pathway to improve health outcomes in this population.

REFERENCES

Agency for Healthcare Research and Quality [AHRQ]. (2012). Disparities in Health Care Quality among Minority Women. *Retrieved August 1, 2014 from* http://www. ahrq.gov qual/nhqrdr11/nhqrminoritywomen11.htm.

Ahn, J., McCombs, J.S., Jung, C., Croudace, T.J., McDonnell, D., Ascher-Svanum, H., Edgell, E.T., Shi, L. (2008). Classifying patients by antipsychotic adherence patterns using latent class analysis: characteristics of nonadherent groups in the California Medicaid (Medi-Cal) program. *Value in Health, 11*(1), 48-56.

American Psychological Association. (2011). The Guidelines for Psychological Practice with Lesbian, Gay, and Bisexual Clients. *Retrieved October 5, 2014 from* http://www.apa.org/pi/lgbt/resources/sexuality-definitions.pdf.

Baltimore City Commission on HIV/AIDS Prevention and Treatment. (2005). Baltimore City Commission on HIV/AIDS Treatment and Prevention Interim Report-HIV/AIDS in Baltimore City: An Ongoing Emergency. *Retrieved September 7, 2014 from* http://www.baltimorecitycouncil.com/main_commissionhiv.htm

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health*, 13, 623-49.

Beatty, L., Wheeler, D.P., Gaither, J. (2004). Effective HIV/AIDS prevention for Black/African Americans. *Journal of Black Psychology, 30*(1), 40-58.

Beronio, K., Po, R., Skopec, L., Glied, S. (2013). ASPE Research Brief: Affordable Care Act Will Expand Mental Health and Substance Use Disorder Benefits and Parity Protections for 62 Million Americans. *Retrieved October 11, 2014 from* http://aspe.hhs.gov/health/reports/2013/mental/rb_mental.pdf.

Blashill, A.J., Bedoya, C.A., Mayer, K.H., O'Cleirigh, C., Pinkston, M.M., Remmert, J.E., Mimiaga, M.J., Safren, S.A. (2014). Psychosocial Syndemics are Additively Associated with Worse ART Adherence in HIV-Infected Individuals. *AIDS & Behavior*, (Epub), doi: 10.1007/s10461-014-0925-6.

Booker, C.L. Harding, S., Benzeval, M. (2011). A systematic review of the effect of retention methods in population-based cohort studies, *BMC Public Health*, 11, 249-61.

Breitbart, V., Chavkin, W., Wise, P.H. (1994). The accessibility of drug treatment for pregnant women: A survey of programs in five cities. *American Journal of Public Health, 84*(10), 1658-61.

Bride, B.E. (2001). Single-gender treatment of substance abuse: Effect on treatment retention and completion. *Social Work Research, 25*(4), 223-32.

Burke, L.E., Dunbar-Jacob, J. (1995). Adherence to medication, diet, and activity

recommendations: from assessment to maintenance. *The Journal of Cardiovascular Nursing,* 9, 62-79.

Centers for Disease Control and Prevention [CDC]. (2009). Late HIV testing—34 states, 1996–2005. *Morbidity & Mortality Weekly Report, 58*(24), 661-5.

CDC. (2012). Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 U.S. dependent areas—2010. *HIV Surveillance Supplemental Report, 17*(3A), 1-20.

CDC. (2014). The Care and Prevention in the United States (CAPUS) Demonstration Project: Secretary's Minority AIDS Initiative Fund for The Care and Prevention in the United States (CAPUS) Demonstration Project. *Retrieved October 10, 2014 from* http://www.cdc.gov/hiv/prevention/demonstration/capus/

Chesney, M.A., Folkman, S. (1994). Psychological impact of HIV disease and implications for intervention. *Psychiatric Clinics of North America,* 17, 163-82.

Collins, L.M., Lanza, S.T. (2010). *Latent class and latent transition analysis: With applications in the social, behavioral, and health sciences.* New York, NY: Wiley Publishing.

DiMatteo, M.R. (2004). Variation in patients' adherence to medical recommendations: A quantitative review of 50 years of research. *Medical Care,* 42, 200-9.

Dunbar, J. (1990). Predictors of patient adherence: Patient characteristics. In S. A. Shumaker, E.B. Schron, & J.K. Ockene (Eds.). *The handbook of health behavior change* (348-360). Springer Publishing: New York, NY.

Edwards, L.V. (2006). Perceived Social Support and HIV/AIDS Medication Adherence among African-American Women. *Qualitative Health Research*, 16, 679-91.

El-Bassel, N., Caldeira N., Ruglass, L., Gilbert, L. (2009). Addressing the unique needs of African-American women in HIV prevention. *American Journal of Public Health, 99*(6), 996-1001.

Feaster, D.J., Brincks, A.M., Mitrani, V.B., Prado, G., Schwartz, S.J., Szapocznik, J. (2010). The Efficacy of Structural Ecosystems Therapy for HIV Medication Adherence with African-American Women. *Journal of Family Psychology, 24*(1), 51–9.

Galvan, F.H., Davis, E.M., Banks, D., Bing, E.G. (2008). HIV stigma and social support among African Americans. *AIDS Patient Care & STDS*, 22, 423-36.

Gray, W., Janicke, D., Fennell, E., Driscoll, D.C., Lawrence, R.M., (2011). Piloting behavioral family systems therapy to improve adherence among adolescents with HIV: a case series intervention study. *Journal of Health Psychology, 16*(5), 828-42.

Gullette, D.L., Wright, P.B., Booth, B.M., Stewart, K.E. (2010). Stages of Change, Decisional Balance, and Self-Efficacy in Condom Use Among Rural African-American Stimulant Users. *Journal of Associated Nurses AIDS Care, 20*(6), 428-41.

Herek, G.M., Capitanio, J.P., Widaman, K.F. (2002). HIV related stigma and knowledge in the United States: prevalence and trends, 1991–1999. *American Journal of Public Health*, 92, 371-7.

Holstad, M., DiIorio, C., Magowe, M., (2006). Motivating HIV Positive Women to Adhere to Antiretroviral Therapy and Risk Reduction Behavior: The KHARMA Project. *Online Journal of Issues in Nursing, 11*(1), 5.

Illangasekare, S., Burke, J., Chander, G., Gielen, A. (2013). The syndemic effects of intimate partner violence, HIV/AIDS, and substance abuse on depression among low-income urban women. *Journal of Urban Health, 90*(5), 934-7.

Joint United Nations Programme on HIV/AIDS (1998). Expanding the global response to HIV/AIDS through focused action: Reducing risk and vulnerability: definitions, rationale and pathways. Geneva, UNAIDS.

Knowlton, A.R., Yang, C., Bohnert, A., Wissow, L., Chander, G., Arnsten, J.A., (2011). Main partner factors associated with worse adherence to ART among women in Baltimore, Maryland: a preliminary study. *AIDS Care, 23*(9), 1102-10.

Long, J.S. (1997). *Regression Models for Categorical and Limited Dependent Variables – Advanced Quantitative Techniques in the Social Sciences.* (1st ed). Thousand Oaks, CA: Sage Publications.

Longshore, D., Grills, C., Anglin, M.D., Annon, D. (1997). Desire for help among African-American drug users. *Journal of Drug Issues*, 27, 755-70.

Losina, E., Schackman, B., Sadownik, S., Gebo, K., Walensky, R., Weinstein, P., Aaronson, L., Moore, R., Paltiel, D., (2007). Disparities in Survival Attributable to Suboptimal HIV Care in the US: Influence of Gender and Race/Ethnicity. *Retrieved September 14, 2014 from* http://www.retroconference.org/2007/Abstracts/29877.htm.

Machtinger, E.L., Bangsberg, D.R. (2005). Adherence to HIV Antiretroviral Therapy. *Retrieved September 26, 2014 from* http://www.hivinsite.ucsf.edu.

Marmot, M.G. (2006). Status syndrome: a challenge to medicine. *JAMA,* 11, 1304-7.

Maryland Infectious Disease and Environmental Health Administration [MIDEHA]. (2012). HIV/AIDS in Baltimore City: An Epidemiological Profile. *Retrieved October 14, 2014 from* http://www.jhsph.edu/research/affiliated-programs/AIDS-linked-to-the-intravenous-experience/_documents/Baltimore_HIV_Statistics_MDHMH.pdf.

McNair, L.D., Prather, C.M. (2004). African American women and AIDS: Factors influencing risk and reaction to HIV disease. *Journal of Black Psychology, 30*(1), 106-23.

Metzl, J.M., Hansen, H. (2014). Structural competency: Theorizing a new medical engagement with stigma and inequality. *Social Science & Medicine*, 103, 126-33.

Meyer, J.P., Springer, S.A., Altice, F.L. (2011). Substance abuse, violence, and HIV in women: a literature review of the syndemic. *Journal of Women's Health, 20*(7), 991-1006.

Mizuno, Y., Purcell, D.W., Knowlton, A.R., Wilkinson, J.D. Gourevitch, M.N., Knight, K.R. (2014). Syndemic Vulnerability, Sexual and Injection Risk Behaviors, and HIV Continuum of Care Outcomes in HIV-Positive Injection Drug Users. *AIDS & Behavior,* (Epub), doi: 10.1007/s10461-014-0890-0.

Mosack, K.E., Petroll, A. (2009). Patients' Perspectives on Informal Caregiver Involvement in HIV Health Care Appointments. *AIDS Patient Care & STDS, 23*(12), 1043-51.

Needle, R.H., Burrows, D., Friedman, S.R., Dorabjee, J., Touzé, G., Badrieva, L., Grund, J.-P.C., Kumar, M.S., Nigro, L., Manning, G., Latkin, C. (2005). Effectiveness of community-based outreach in preventing HIV/AIDS among injecting drug users. *International Journal of Drug Policy, 16*(S1), S45-57.

Neumann, M.S., Johnson, W.D., Semaan, S., Flores, S.A., Peersman, G., Hedges, L.V., Sogolow, E., (2002). Review and meta-analysis of HIV prevention intervention research for heterosexual adult populations in the United States. *Journal of Acquired Immune Deficiency Syndromes*, 30, S106-7.

Prejean, J., Song, R., Hernandez, A., Ziebell, R., Green, T., Walker, F., Lin, L.S., An, Q., Mermin, J., Lansky, A., Hall, H.I., HIV Incidence Surveillance Group. (2011). Estimated HIV Incidence in the United States, 2006-2009. *PLOS ONE 6*(8), e17502.

Quinlivan, E.B., Fletcher, J., Eastwood, E.A., Blank, A.E., Verdecias, N., Roytburd K. (2015). Health Status of HIV-Infected Women Entering Care: Baseline Medical Findings from the Women of Color Initiative. *AIDS Patient Care & STDS, 29*(S1), S11-9.

Radcliffe, M. (2000). Doctors and nurses: new game, same result. *British Medical Journal,* 320, 1082-5.

Robertson, M. (2006). Books reconsidered: Emile Durkheim, Le Suicide. *Australasian Psychiatry*, 14: 365-38.

Rossiter, J.R. (2008). Content Validity of Measures of Abstract Constructs in

Management and Organizational Research. *British Journal of Management, 19*(4), 380-8.

Rotheram-Borus, M.J., Rice, E., Comulada, W.S., Best, K., Elia, C., Peters, K., Li, L., Green, S., Valladares, E. (2012). Intervention Outcomes among HIV-affected Families Over 18 Months. *AIDS & Behavior, 16*(5), 1265-75.

Rotheram-Borus, M.J., Swendeman, D., Lee, S., Li L., Amani, B., Nartey, M. (2011). Interventions for families affected by HIV. *Translational Behavioral Medicine, 1*(2)*,* 313-26.

Rowe, M., Bellamy, C., Baranoski, M., Wieland, M., O'Connell, M.J., Benedict, P., Davidson, L., Buchanan, J., Sells, D. (2007). A peer-support, group intervention to reduce substance use and criminality among persons with severe mental illness. *Psychiatric Services, 58*(7), 955-61.

Saha, S., Korthuis, P.T., Cohen, J.A., Sharp, V.L., Moore, R.D., Beach, M.C. (2013). Primary care provider cultural competence and racial disparities in HIV care and outcomes. *Journal of General Internal Medicine*, 28, 622-9.

Schackman, B.R., Gebo, K.A., Walensky, R.P., Losina, E., Muccio, T., Sax, P.E., Weinstein, M.C., Seage, G.R., Moore, R.D., Freedberg, K. A. (2006). The lifetime cost of current human immunodeficiency virus care in the United States. *Medical Care*, 44, 990-7.

Schröder, K.E., Hobfoll, S.E., Jackson, A.P., Lavin, J. (2001). Proximal and Distal Predictors of AIDS Risk Behaviors among Inner-city African American and European American Women. *Journal of Health Psychology, 6*(2), 169-90.

Schumacher, W.E., Frick, M., Kauselmann, V., Maier-Hoyle, R., van der Vliet, R., Babiel, R. (2007). Fully automated quantification of human immunodeficiency virus (HIV) type 1 RNA in human plasma by the COBAS AmpliPrep/COBAS Taqman system. *Journal of Clinical Virology*, 38, 304-12.

Social Security Administration. (2005). Social Security For People Living With HIV/AIDS. *Retrieved October 20, 2014 from* http://www.ssa.gov/pubs/EN-05-10019.pdf.

Shapiro, M.F., Morton, S.C., McCaffrey, D.F., Senterfitt, J.W., Fleishman, J.A., Perlman, J.F., Athey, L.A., Keesey, J.W., Goldman, D.P., Berry, S.H., Bozzette, S.A. (1999). Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. *JAMA, 281*(24), 2305-15.

Singer, M. (1996). A Dose of Drugs, a Touch of Violence, a Case of AIDS: Conceptualizing the SAVA Syndemic. *Free Inquiry in Creative Sociology, 24*(2), 99-110.

Singer, M., Clair, S. (2003). Syndemics and public health: reconceptualizing disease in

bio-social context. *Medical Anthropology Quarterly, 17(*4), 423-41.

Tolle, M. (2009). A package of primary health care services for comprehensive family centered HIV/AIDS care and treatment programs in low income settings. *Tropical Medicine & International Health*, *14*(6), 663-72.

Tracy, E.M., Martin, T.C. (2007). Children's roles in the social networks of women in substance abuse treatment. *Journal of Substance Abuse Treatment, 32*(1), 81-8.

Tucker, J.S., Burnam, M.A., Sherbourne, C.D., Kung, F.Y., Gifford, A.L. (2003). Substance use and mental health predictors of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *American Journal of Medicine, 114*(7), 573-80.

U.S. Department of Health and Human Services. (2012). National HIV/AIDS Strategy Implementation Progress Report. *Retrieved October 15, 2014 from* http://www.aids.gov/federal-resources/national-hiv-aids-strategy/hhs-2012-nhas-progress-report.pdf.

Wingood, G.M., DiClemente, R.J. (2000). Application of the theory of gender and power to examine HIV related exposures, risk factors and effective interventions for women. *Health Education & Behavior,* 27, 539-65.

Yehia, B., Frank, I. (2011). Battling AIDS in America: An Evaluation of the National HIV/AIDS Strategy. *American Journal of Public Health*, 101, e4-8.

Zea, M., Reisen, C., Poppen, P., Bianchi, F., Echeverry, J. (2005). Disclosure of HIV status and psychological well-being among Latino gay and bisexual men. *AIDS & Behavior, 9*(1), 15-26.

APPENDIX A

SUMMARY OF ADDITIONAL ANALYSES

Included in these appendices are analyses not detailed in Chapter One through Chapter Seven. Appendix A.1 summarizes HIV medical adherence among participants by sex at Baseline (Time 1), and 6-months follow-up (Time 2). Longitudinal analyses were not conducted, due to sample size (statistical power) limitations, and an insufficient number of time points. Next, structural equation measurement models were assessed for each *SUMIC* Syndemic factor, and are depicted in Appendices A.2 through A.4. Appendix A.5 is a figure depicting the rates of HIV medical adherence by *SUMIC* Syndemic latent class among the full sample of 383 participants. Appendix A.6 depicts latent class analyses (LCA) conducted on the full sample. Appendix A.7 summarizes fit statistics of the LCA, which yielded a four-class solution (Chapter Five).

The findings summarized in Appendices A.5 through A.8 were omitted in the main text, because of theoretical significance of assessing these factors among African-American Indexes only (N=351). Similarly, Appendix A.8 depicts a multivariate logistic regression of correlates of HIV medical adherence among the full sample, and instrumental support refers to whether someone helped you run errands in the last year. However, these analyses were omitted for several reasons: 1) Poisson regression was more appropriate for non-rare binary outcome data; 2) a simple count of number of syndemic factors did not address the unique variation in type of factors; 3) African-Americans only analyses addressed the dissertation research aims more appropriately.

Appendix A.9 depicts HIV medical adherence by syndemic factors among males, and Appendix A.10 depicts this among females. Regression and latent class analyses were conducted among African-Americans instead, in the main dissertation chapters.

ADDITIONAL ANALYSES

Appendix A.1. HIV medical adherence of Indexes over time by sex (BEACON dataset)

Viral suppression over time by sex

Sex	Percentage who achieved viral suppression N (%)	
	Time 1 (baseline)	**Time 2 (6-months follow-up)**
	(*N*=253)	(*N*=206)
Males	156 (66.4)	127 (57.2)
Females	97 (65.5)	79 (57.7)

Optimal acute care utilization over time by sex

Sex	Percentage reporting fewest ED visits and hospitalizations N (%)	
	Time 1 (baseline)	**Time 2 (6-months follow-up)**
	(*N*=253)	(*N*=206)
Males	71 (30.2)	50 (22.5)[ǂ]
Females	48 (32.4)	43 (31.4)[ǂ]

[ǂ] *marginally significant (p<.10)*

Appendix A.2. Measurement model of substance use factor loadings and fit (N=383)[a]

Syndemic Factor and Indicators	Model 1 Standard(SE)	Model 2 Standard(SE)	Model 3 Standard(SE)
Active substance use			
Opiates in last 30 days	0.44*** (0.10)	0.50*** (0.10)	0.49*** (0.10)
Marijuana in last 30 days	0.54*** (0.10)	0.51*** (0.10)	0.50*** (0.07)
Heroin in last 30 days	0.86*** (0.06)	0.85*** (0.05)	0.84*** (0.05)
Cocaine or crack in last 30 days	0.97*** (0.07)	0.98*** (0.05)	0.99*** (0.06)
Hallucinogens in last 30 days	---	---	0.38** (0.06)
Prescription drugs in last 30 days	---	0.69*** (0.10)	0.69*** (0.10)
Residual variances			
Opiates in last 30 days	0.81** (0.07)	0.75** (0.08)	0.77** (0.07)
Marijuana in last 30 days	0.71*** (0.08)	0.74*** (0.08)	0.75*** (0.07)
Heroin in last 30 days	0.26*** (0.11)	0.28*** (0.09)	0.29*** (0.09)
Cocaine or crack in last 30 days	0.06*** (0.13)	0.05*** (0.11)	0.02*** (0.11)
Hallucinogens in last 30 days	---	---	0.85** (0.05)
Prescription drugs in last 30 days	---	0.53*** (0.11)	0.53*** (0.11)
R^2			
Opiates in last 30 days	0.19**	0.25**	0.23**
Marijuana in last 30 days	0.29***	0.26***	0.25***
Heroin in last 30 days	0.74***	0.72***	0.71***
Cocaine or crack in last 30 days	0.94***	0.96***	0.98***
Hallucinogens in last 30 days	---	---	0.15**
Prescription drugs in last 30 days	---	0.47***	0.47***
Fit statistics			
χ^2 (df)	1.15 (2)	9.33 (5)	11.37 (9)
CFI	1.00	0.99	1.00
RMSEA	0.00	0.05	0.03

[a]Each model has a variance fixed at 1, rather than a factor loading fixed at 1, to ensure each model's identifiability. The shaded model was selected for theoretical underpinnings, and acceptable fit statistics (Model 3).

*p<.05, **p<.01, ***p<.001

Appendix A.3. Measurement model of mental illness factor loadings and fit (N=383)[a]

Syndemic Factor and Indicators	Model 1 Standard(SE)	Model 2 Standard(SE)	Model 3 Standard(SE)
Mental illness			
Ever received therapy or medication	---	0.10 (0.10)	-0.17** (0.07)
Diagnosed with depression	0.89*** (0.05)	0.90*** (0.05)	0.88*** (0.05)
Diagnosed with bipolar disorder	0.89*** (0.05)	0.90*** (0.05)	0.89*** (0.05)
Diagnosed with anxiety or PTSD	0.73*** (0.06)	0.71*** (0.06)	0.73*** (0.06)
Diagnosed with schizophrenia	0.68*** (0.07)	0.68*** (0.07)	0.68*** (0.07)
Diagnosed with other psychiatric illness	0.36** (0.12)	---	0.49*** (0.11)
Residual variances			
Ever received therapy or medication	---	0.99 (0.02)	0.97 (0.02)
Diagnosed with depression	0.20*** (0.09)	0.19*** (0.09)	0.23*** (0.09)
Diagnosed with bipolar disorder	0.20*** (0.09)	0.20*** (0.09)	0.20*** (0.09)
Diagnosed with anxiety or PTSD	0.47*** (0.08)	0.49*** (0.10)	0.47*** (0.10)
Diagnosed with schizophrenia	0.54*** (0.10)	0.54*** (0.10)	0.54*** (0.10)
Diagnosed with other psychiatric illness	0.87 (0.08)	---	0.76* (0.11)
R^2			
Ever received therapy or medication	---	0.01	0.03
Diagnosed with depression	0.80***	0.81***	0.77***
Diagnosed with bipolar disorder	0.80***	0.80***	0.80***
Diagnosed with anxiety of PTSD	0.53***	0.51***	0.53***
Diagnosed with schizophrenia	0.46***	0.46***	0.46***
Diagnosed with other psychiatric illness	0.13	---	0.24*
Fit statistics			
χ^2 (df)	2.41 (5)	9.84 (5)	75.65*** (9)
CFI	1.00	0.99	0.90
RMSEA	0.00	0.05	0.14

[a]Each model has a variance fixed at 1, rather than a factor loading fixed at 1, to ensure each model's identifiability. The shaded model was selected for theoretical underpinnings, and acceptable fit statistics (Model 1).

*p<.05, **p<.01, ***p<.001

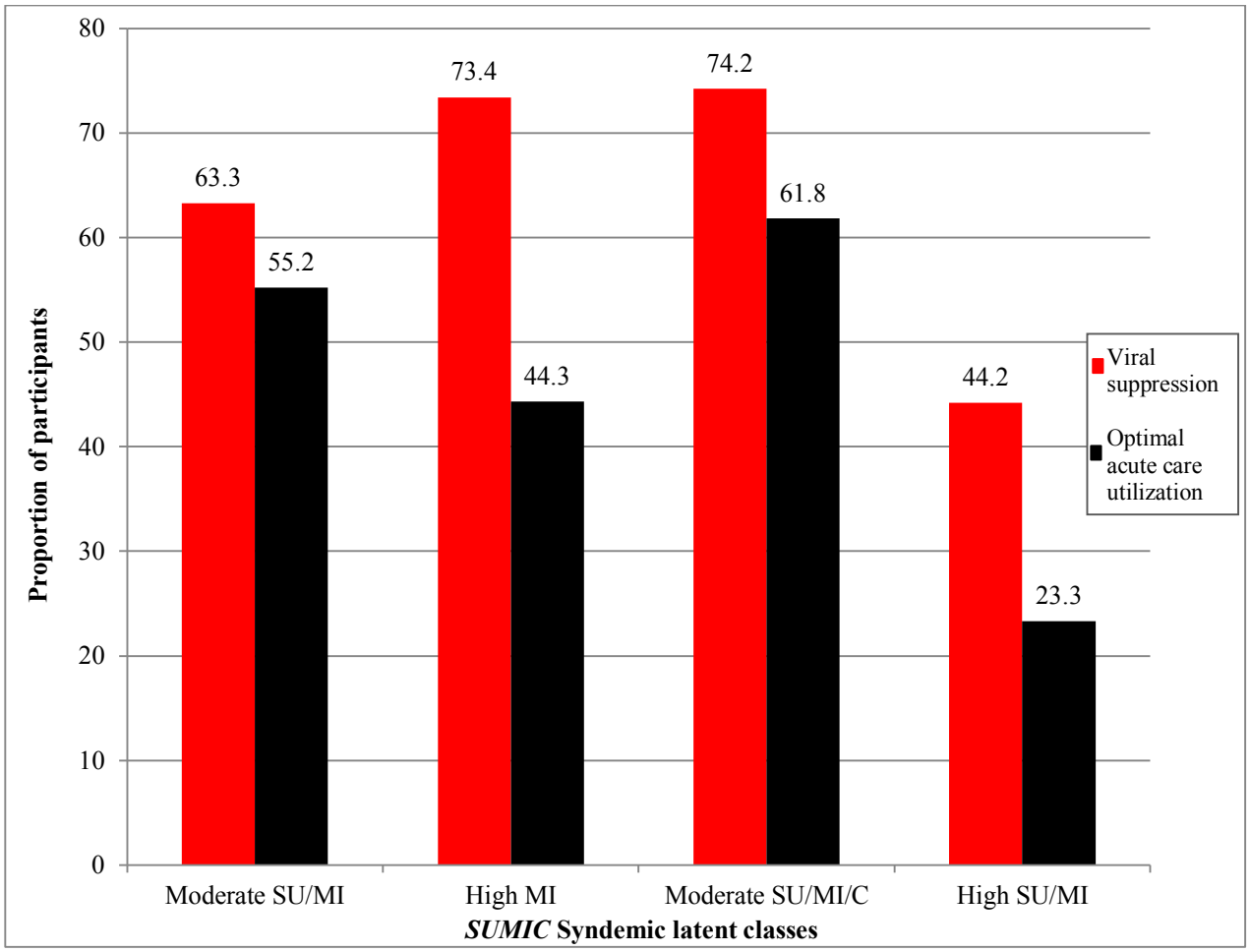
Appendix A.4. Measurement model of familial conflict factor loadings and fit (N=383)[a]

Syndemic Factor and Indicators	Model 1 Standard(SE)
Familial conflict	
Family rarely/never talks about problems	0.94*** (0.06)
Family rarely/never problem solves together	0.96*** (0.06)
Family rarely/never shows caring for each other	0.74*** (0.06)
Residual variances	
Family rarely/never talks about problems	0.12*** (0.11)
Family rarely/never problem solves together	0.10*** (0.11)
Family rarely/never shows caring for each other	0.45*** (0.09)
R²	
Family rarely/never talks about problems	0.88***
Family rarely/never problem solves together	0.92***
Family rarely/never shows caring for each other	0.55***
Fit statistics	
χ^2 (*df*)	0.00*** (0)
CFI	1.00
RMSEA	0.00

[a]Each model has a variance fixed at 1, rather than a factor loading fixed at 1, to ensure each model's identifiability. The shaded model was selected for theoretical underpinnings, and acceptable CFI and RMSEA.

*p<.05, **p<.01, ***p<.001

Appendix A.5. HIV medical adherence by *SUMIC* Syndemic latent class (*N*=383)[a,b]



[a]*Significant association between viral suppression and SUMIC Syndemic class (χ^2=14.18, p<.01)*

[b]*Significant association between optimal acute care utilization and SUMIC Syndemic class (χ^2=20.05, p<.001).*

Appendix A.6. Probability of *SUMIC* Syndemic statements by latent class (*N*=383)

Items	Class 1 *LO Syndemic*	Class 2 *LO/MED Syndemic*	Class 3 *MED/HI Syndemic*	Class 4 *HI Syndemic*
Active substance use				
Opiates in last 30 days	13.9***	06.7*	13.5**	37.5***
Marijuana in last 30 days	12.6***	02.8	20.8***	42.3***
Heroin in last 30 days	19.4***	01.5	18.0**	70.3***
Cocaine or crack in last 30 days	30.8***	04.6	34.6***	100
Hallucinogens in last 30 days	01.9	---	---	---
Prescription drugs in last 30 days	03.9*	---	03.5	30.3***
Mental illness				
Diagnosed with depression	31.5***	94.0***	63.5***	95.5***
Diagnosed with bipolar disorder	---	80.1***	34.5***	74.9***
Diagnosed with anxiety or PTSD	05.6*	50.0***	32.4***	51.9***
Diagnosed with schizophrenia	---	14.1***	08.7*	40.0***
Diagnosed with other psychiatric illness	02.0	11.1**	06.8*	06.7
Familial conflict				
Family rarely/never talks about problems	06.2**	11.5‡	94.5***	35.1**
Family rarely/never problem solves together	03.8*	08.4	93.6***	38.0**
Family rarely/never shows caring for each other	---	02.2	29.4***	10.0

*p<.05, **p<.01, ***p<.001

Appendix A.7. Latent class analysis fit statistics

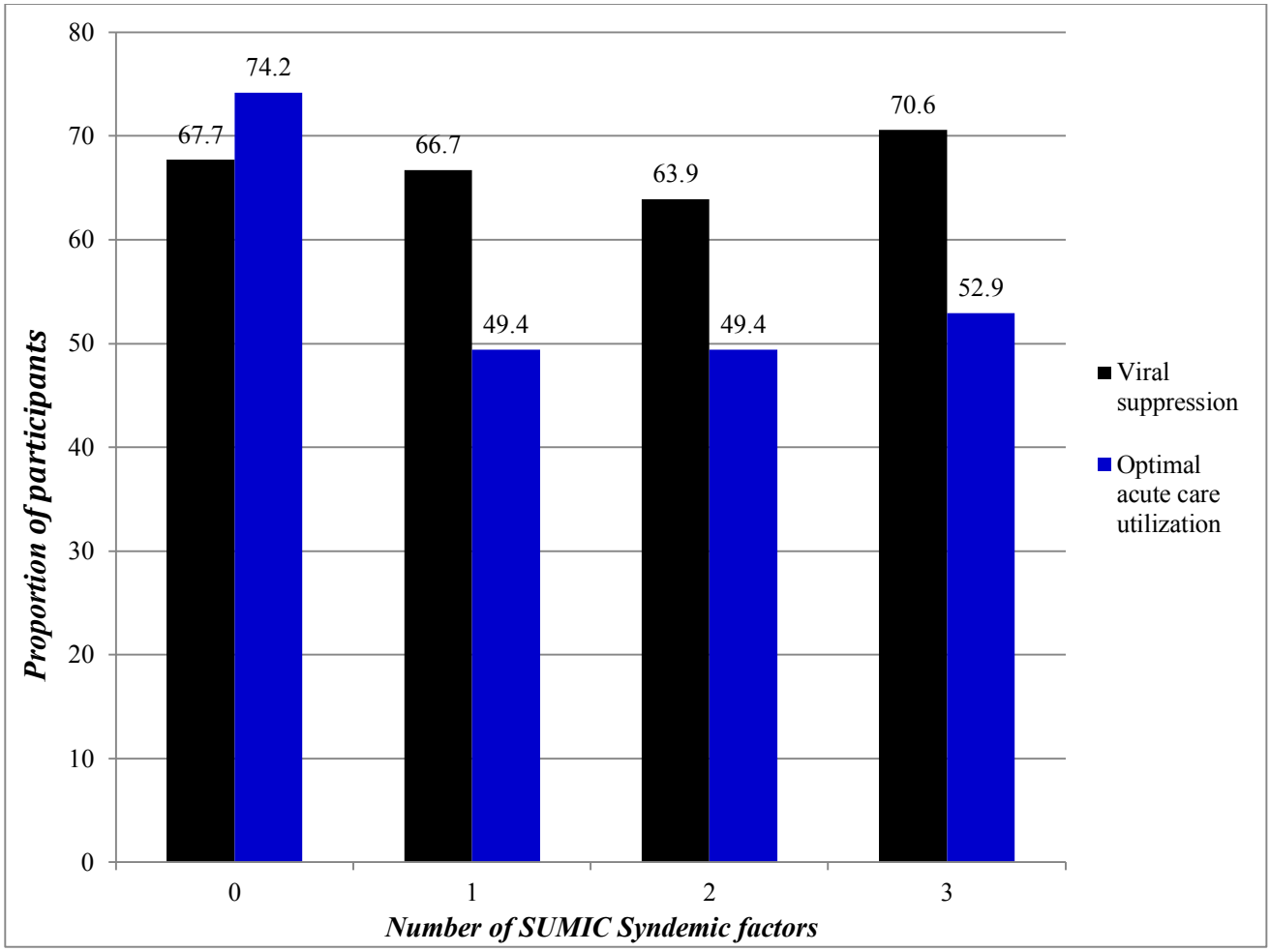
Number of Latent Classes	Akaike Information Criteria	Bayesian Information Criteria	Entropy
2	4548.7	4663.2	0.75
3	4389.2	4563.0	0.83
4	4289.3	4522.3	0.85
5	4237.3	4529.5	0.85
6	4196.2	4547.6	0.86

Appendix A.8. Unadjusted and adjusted correlates of HIV medical adherence (*N*=359)

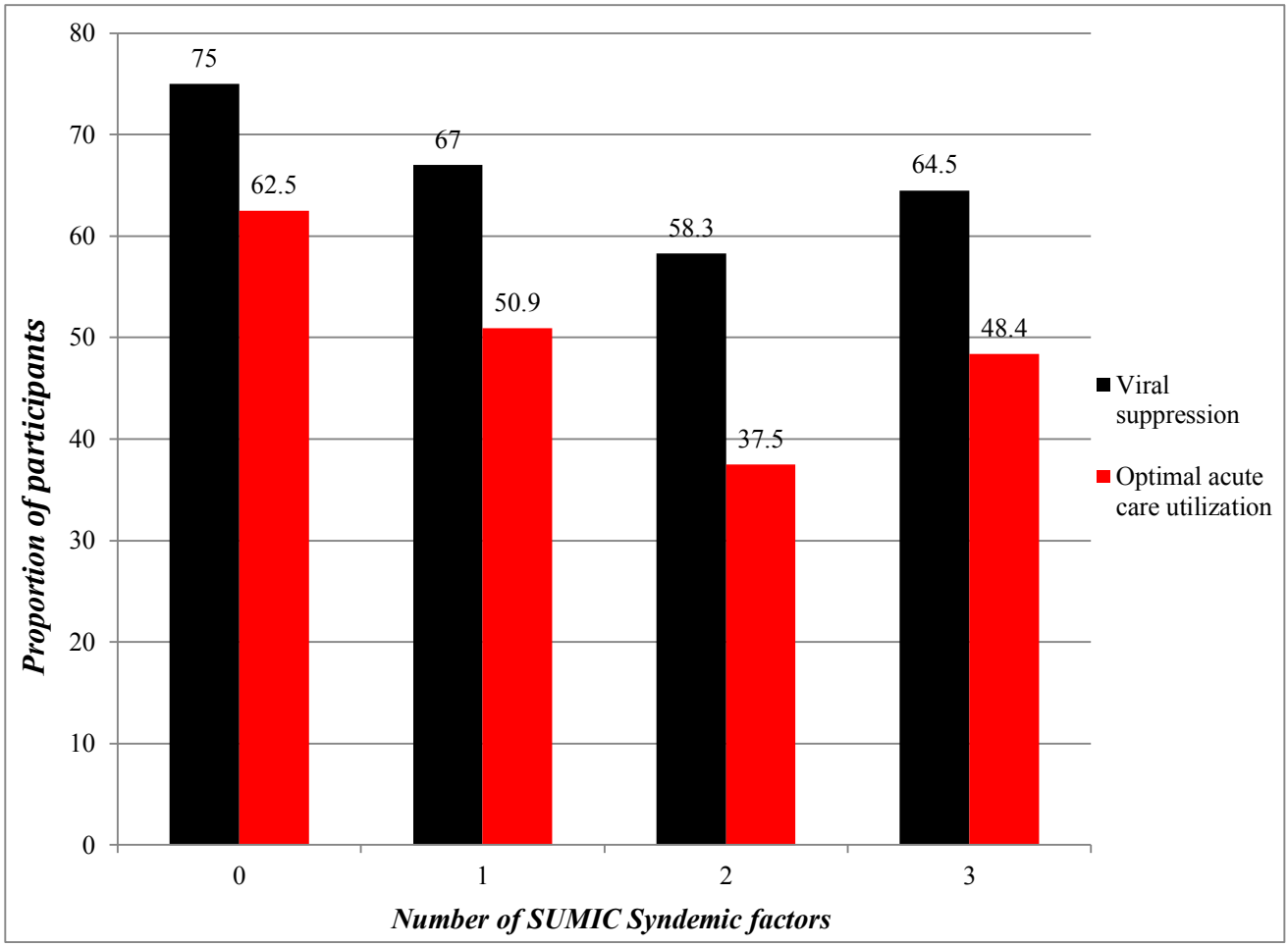
	Viral suppression				Optimal acute care utilization			
	OR[a]	**CI[c]**	**AOR[b]**	**CI**	**OR**	**CI**	**AOR**	**CI**
***SUMIC* Syndemic**								
1 factor	0.87	(0.42, 1.78)	0.98	(0.44, 2.16)	0.42*	(0.21, 0.86)	0.44*	(0.20, 0.97)
2 factors	0.69	(0.34, 1.41)	0.84	(0.37, 1.87)	0.35***	(0.17, 0.71)	0.46‡	(0.21, 1.03)
3 factors	0.89	(0.39, 2.00)	1.36	(0.53, 3.48)	0.44*	(0.20, 0.97)	0.54	(0.22, 1.32)
(ref: 0 factors)	1.00		1.00		1.00		1.00	
Health status								
Very good	1.52	(0.68, 3.39)	1.27	(0.53, 3.09)	0.86	(0.42, 1.72)	1.00	(0.46, 2.19)
Good	0.67	(0.36, 1.26)	0.51‡	(0.25, 1.03)	0.50*	(0.28, 0.91)	0.61	(0.31, 1.17)
Fair	0.55‡	(0.28, 1.10)	0.47*	(0.22, 1.01)	0.35**	(0.18, 0.68)	0.36**	(0.17, 0.75)
Poor	0.19**	(0.07, 0.53)	0.14**	(0.04, 0.47)	0.16***	(0.05, 0.50)	0.24*	(0.07, 0.80)
(ref: Excellent)	1.00		1.00		1.00		1.00	
Education								
Some high school	2.42*	(1.04, 5.65)	2.15	(0.84, 5.48)	0.77	(0.33, 1.78)	0.74	(0.29, 1.88)
High school/GED	2.76*	(1.18, 6.46)	2.35‡	(0.91, 6.10)	1.05	(0.46, 2.43)	0.90	(0.35, 2.31)
Some college	3.75*	(1.35, 10.41)	3.78*	(1.21, 11.84)	0.57	(0.22, 1.51)	0.57	(0.19, 1.73)
College degree	5.45‡	(0.96, 30.89)	3.60	(0.53, 24.20)	2.00	(0.42, 9.49)	1.10	(0.16, 7.53)
Graduate school	---		---		2.14	(0.35, 13.12)	2.27	(0.19, 27.65)
(ref: 8th grade/less)	1.00		1.00		1.00		1.00	
Monthly income								
$500-$999	1.47	(0.88, 2.46)	1.35	(0.75, 2.45)	1.00	(0.61, 1.64)	0.90	(0.51, 1.61)
$1000+	1.56	(0.82, 2.97)	0.97	(0.45, 2.06)	2.20*	(1.17, 4.14)	1.81	(0.86, 3.83)
(ref: $0-$499)	1.00		1.00		1.00		1.00	
Support reciprocity								
Medium	0.42**	(0.23, 0.77)	0.33***	(0.17, 0.65)	0.62	(0.35, 1.09)	0.51*	(0.27, 0.95)
High	0.52*	(0.30, 0.91)	0.46**	(0.25, 0.84)	0.64‡	(0.39, 1.04)	0.62	(0.35, 1.09)
(ref: Low)	1.00		1.00		1.00		1.00	
Inform. ART supp								
Sometimes	0.67	(0.30, 1.49)	0.46‡	(0.19, 1.11)	0.77	(0.38, 1.59)	0.79	(0.36, 1.73)
Often	0.48‡	(0.22, 1.04)	0.37*	(0.16, 0.85)	0.42**	(0.21, 0.84)	0.50‡	(0.23, 1.07)
(ref: Rarely)	1.00		1.00		1.00		1.00	
Instrumental supp	0.89	(0.58, 1.35)	1.13	(0.67, 1.89)	0.47***	(0.31, 0.71)	0.61*	(0.38, 1.00)
Females	0.93	(0.61, 1.44)	1.17	(0.70, 1.97)	0.79	(0.52, 1.19)	1.02	(0.63, 1.66)

‡*marginally significant* $p<.10$, *$p<.05$, **$p<.01$, ***$p<.001$ [a]OR = Unadjusted Odds Ratio [b]AOR = Adjusted Odds Ratio [c]CI = 95% Confidence Interval

Appendix A.9. HIV medical adherence of males by number of *SUMIC* Syndemic factors (*N*=235)



Appendix A.10. HIV medical adherence of females by number of *SUMIC* Syndemic factors (*N*=148)



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SCHOLARLY LIFE

Allysha Camille Robinson was born on December 9, 1985. She is originally from Miami, Florida, and is the youngest daughter of Trevor and Monica Robinson. She is a first-generation Jamaican-American. She grew up in South Florida, and graduated from Flanagan High School in 2003, with honors and in the top two percent of her class. She was a 2003 National Merit/National Achievement Scholar, and won a full scholarship to the University of Florida (UF), where she majored in Psychology and minored in Spanish. Upon her graduation in 2007, she was a Golden Key Honour Society Inductee, UF Honors College Graduate, an Anderson Scholar, a Four-Year Scholar, and graduated cum laude with a 3.9 Grade Point Average.

She remained at the University of Florida to pursue graduate studies, and completed her Master's in Public Health in Social and Behavioral Sciences in 2009. During her undergraduate and graduate studies, Allysha held several leadership roles as a Research Assistant, Graduate Research Director, and Data Collection Coordinator for Dr. Carolyn M. Tucker's Behavioral Medicine Research (BMED) Team, in the UF Department of Psychology. Her tenure on the BMED team consisted of planning, implementing, and evaluating obesity and type 2 diabetes interventions in low-income communities.

These projects include a national primary care patient satisfaction study funded by the Robert Wood Johnson Foundation, as well as a health promotion program in low-income family households which was funded by the PepsiCo Foundation. Her

independent master's thesis was a church-based, health-promotion project funded by the Blue Foundation for a Healthy Florida. Also during her graduate studies, she won numerous honors including a research award for a prospective study of HIV risk in adolescents, and an award for outstanding community involvement from the UF College of Public Health and Health Professions. Robinson also conducted a study, published in the Florida Public Health Review, which outlined strategies to advocate for bus stop accessibility on behalf of persons with disabilities.

Upon graduating with her MPH in 2009, Allysha stayed on the BMED team as a Graduate Research Intern with the UF Centers for Health Disparities, founded by Dr. Tucker. Simultaneously, she served as an Adjunct Lecturer in research methodology for the Bachelor of Health Science Program at UF. As a result, her broad training in social sciences, public health, patient-centered cultural sensitivity research, and health disparities led her to pursue a PhD in Social Behavioral Sciences. She was a 2010 Brown Scholar in Community Health, when she entered the Department of Health, Behavior, and Society at the Johns Hopkins Bloomberg School of Public Health.

Much of her time at Hopkins has focused on research in HIV/AIDS among African-American persons who inject drugs in East Baltimore. She was a Research Assistant at the Lighthouse Studies at Peer Point in the Department of Health, Behavior and Society, and with the Behavioral Surveillance Research study funded through the Centers for Disease Control and Prevention, and the Maryland Department of Health and Mental Hygiene. She is currently a Predoctoral Fellow at the Center for Surgical Trials and Outcomes Research in the Department of Surgery in the Johns Hopkins School of

Medicine. There, she co-leads the qualitative data collection of a study to design, implement, and evaluate the comparative effectiveness of several approaches for collective sexual health information in the emergency department setting. Upon graduation, Allysha will relocate to Boston and assume a fulltime postdoctoral fellowship position with this project at Harvard's Brigham and Women's Hospital, in the Center for Surgery and Public Health. In her future career as a Behavioral Scientist, Allysha plans to conduct grant-funded health disparities research, teach research methods in the social sciences, and mentor new researchers.